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ABSTRACT

This study presents regional and racial trends in science achievement for black and white students ages 9, 13, and 17 between 1969-70 and 1972-73. The study also presents changing patterns in the racial composition of schools. Among the findings was that in the nation as a whole, science achievement declined between 1969-70 and 1972-73. Declines between approximately 1 and 3 percentage points were observed for both blacks and whites at all three ages. Graphs and tables are provided for science achievement according to race, region of the country, and age, and for the racial composition of schools for various regions of the country. (MP)

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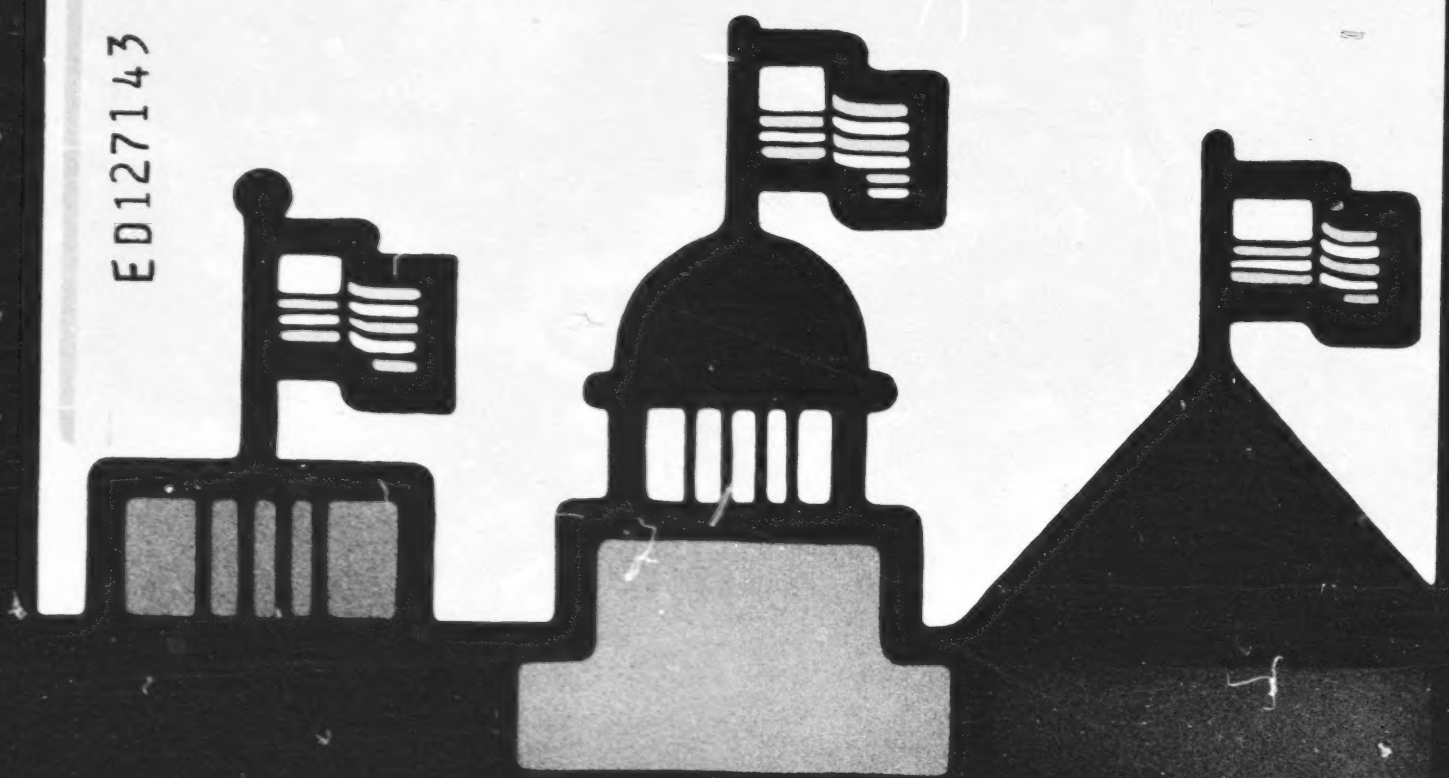

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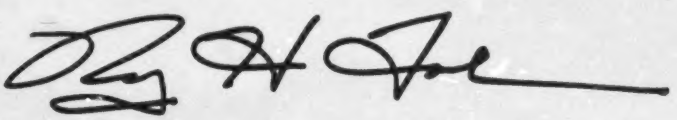

Roy H. Forbes
Project Director

A PERSPECTIVE ON THE STUDY

Changes in science achievement of ages 9, 13 and 17 have been previously reported in *A Capsule Description of Changes in Science Achievement.*[1] These changes in science achievement were not consistent in all regions of the country or for black and white students alike. This report examines in greater detail the differences in achievement trends between the Southeast region and the rest of the country and between blacks and whites in both of these areas. These trends are reported in Chapter 3.

A variety of factors affect academic achievement over time. Among these factors are changes in enrollment patterns in science, changes in federal funding patterns, changing migration patterns, changing patterns in the racial composition of the schools, changing regional industrialization patterns, changes in the science curriculum and changes in socio-economic status. While National Assessment and others have examined some of these, a great deal more research still needs to be done to understand the relationship of these various factors to achievement. Caution must be taken not to attribute cause-and-effect relationship to any one factor. The factors listed here are in no sense exhaustive, yet they point out some of the difficulties involved in interpreting observational data and underscore our concern that the information presented in this report is cautiously and carefully considered.

---

[1] *National Assessments of Science, 1969 and 1973: A Capsule Description of Changes in Science Achievement, Report 04-S-00* (Washington, D.C.: Government Printing Office, 1975).

CHAPTER 1

A SUMMARY OF BASIC FINDINGS

This study presents regional and racial trends in science achievement for black and white students ages 9, 13 and 17 between 1969—70 and 1972—73. The major achievement findings are:

1. In the nation as a whole, science achievement declined between 1969—70 and 1972—73. Declines between approximately 1 and 3 percentage points were observed for both blacks and whites at all three ages.

2. Declines in science achievement were smaller in the Southeast than in the other regions. Although white students generally showed declines in science achievement nationwide, the declines for white students in the Southeast were generally not as great as elsewhere.

3. The achievement of 9-year-old blacks in the Southeast improved, and the achievement of 13- and 17-year-old blacks did not decline as much as the performances of blacks in the rest of the nation.

4. For black students of all three ages in the rest of the nation — the Northeast, Central and Western regions — declines in science achievement were generally larger than those of white students or those of Southeastern blacks. The one exception was at age 17.

This study also presents changing patterns in the racial composition of schools. The major findings are:

1. In 1969-70 the Southeastern schools were still segregated to a large extent with approximately 70% of the black students attending schools that had fewer than 10% white students. About 85% of the white students attended schools that were between 80 and 100% white in composition. Three years later (1972—73) approximately 20% of the black students were in schools with fewer than 10% white students, and approximately 50% of the Southeastern blacks went to schools that were at least half white.

2. In the rest of the nation — the Northeast, Central and Western regions — school composition showed relatively small changes between 1969 and 1973.

CHAPTER 2

METHODS

Developmental History

The National Assessment of Educational Progress (NAEP) monitors the educational achievement of American youth at ages 9, 13 and 17. Each year since 1969 National Assessment has gathered information about educational achievement across the country and reported its findings to the nation. During the first five years of this endeavor, National Assessment interviewed and tested more than 400,000 representative young Americans. Baseline data on achievement in eight learning areas — science, social studies, music, literature, reading, writing, mathematics and citizenship — have been collected and reported. By 1975 both science and writing had been assessed twice and data on changes in achievement in both learning areas were reported to the nation.[1]

National Assessment change reports are based on repeated cross-sectional data that compare the performance of *different* students at two points in time. For example, NAEP assessed one probability sample of 9-year-olds to ascertain science achievement in 1970 and another totally different probability sample in 1973. Each group is representative of the population of students who were 9 years old during the assessment year. Thus, when we say that 9-year-old Southeastern-black achievement improved, we mean that those who were 9 years old in 1973 achieved better than those who were 9 years old in 1970.

The initial National Assessment science study took place in the 1969—70 school year. A second assessment was administered in 1972—73.[2] In both studies 9-year-olds, 13-year-olds and 17-year-olds attending school were asked questions covering four broad educational objectives in science. These objectives are (1) that Americans should know some fundamental facts and principles of science, (2) that they should possess some abilities and skills needed to engage in the process of science, (3) that they should understand the investigative nature of science and (4) that they should have some attitudes about science and appreciate its role in the culture. Many of the questions asked in the first science assessment were withheld from the public and repeated in the second science assessment. For the purposes of this study, however, changes were analyzed only for cognitive questions. In all, 92 questions were asked at age 9, 67 at age 13 and 64 at age 17.

Statistics

The data provide an estimate of the percentage of individuals in a given group who could respond correctly *to a given question.* Approximately 65,000 students nationally participated in each science assessment, with about 2,500 of these answering a given question.[3] Achievement trends were calculated by comparing the mean percentage of individuals in a given group who responded acceptably to the science questions in 1969—70 with the mean percentage of individuals in that same group who responded acceptably to the same questions repeated in 1972—73. The difference between the means is an indicator of the changes in the level of achievement for a given group.[4]

The statistics in this report are derived from a sample survey and are subject to sampling

variability because observations are made only on a sample, not on the entire population. The particular sample in this survey is one of a large number of all possible samples of the same size that could have been selected using the same sample design. The average or mean percents correct computed from the different samples, then, would differ from each other.

A standard error of the mean is a measure of the sampling variation among the means of all possible samples. A standard error of the mean is used in determining the precision of the mean obtained in a particular sample. The intervals from two standard errors below to two standard errors above the corresponding mean will include the average of all possible means in 95% of the samples. A particular interval computed in this way is called a 95%-confidence interval to indicate how certain we are that the interval we constructed contains the average of all possible samples. For example, if a mean were 50.0% with a standard error of 0.5, then an approximate 95%-confidence limit would be between 49.0 and 51.0%.

The standard error of the mean is also used to determine the probability of having obtained samples showing a change as large as the change actually observed when the average of all possible samples would have shown no decline (i.e., zero change).

Probability statements specifying levels of statistical significance are indicated in the text by notations such as ($p<.04$). That notation reveals that the reported change is statistically significant at less than the .04 level. A change as large as this would be expected to happen by chance in less than 4% of all possible samples of this size.[5] Because no significance level is universally accepted, the computed level was provided in each case.

Group Definitions

Students participating in the National Assessment science assessment were classified black, white or other in 1969—70. Breakdown of the "other" category was made in the 1972—73 assessment. These students were identified as Puerto Rican, Mexican-American or other. This racial identification was done by the test administrators using visual observation and surnames if possible. Because of the difficulties and cost involved in collecting large enough national samples of the "other" racial groups to provide reliable information, only data for black and white students in the nation are reported in this study.

This report is also limited to two regional categories for blacks and whites. The Southeast region is composed of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia. The Northeast, Central and Western regions make up the combined NCW region. It includes the District of Columbia and all 38 states not included in the Southeast.

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[1] *National Assessments of Science, 1969 and 1973: A Capsule Description of Changes in Science Achievement, Report 04-S-00* (Washington, D.C.: Government Printing Office, 1975) and *Writing Mechanics, 1969—1974: A Capsule Description of Changes in Writing Mechanics, Report 05-W-01* (Washington, D.C.: Government Printing Office, 1975).

[2] The assessment schedule varied for each age level. The actual administration dates were:

9-year-olds	Jan.—Feb. 1970	Jan.—Feb. 1973
13-year-olds	Oct.—Dec. 1969	Oct.—Dec. 1972
17-year-olds	March—May 1969	March—May 1973

[3] The exact number of students varied in each year for the three age levels. See Appendix D, Tables D1—D3 for a complete breakdown of the number of students in each science assessment upon which data in this report are based.

[4] It should be noted that when groups are of unequal size the mean of combined groups is not generally equal to the simple average of the means for the individual groups. Furthermore, the racial composition of the regions also changed between 1969—70 and 1972—73. More detailed discussion is found in Appendix A. Data on group proportions during 1969—70 and 1972—73 are given in Appendix A, Table A1.

[5] Jackknifing procedures were used to estimate standard errors by National Assessment. A general discussion of these procedures is found in Rupert G. Miller, "Jackknifing Variances," *Annals of Mathematical Statistics*, 39, No. 2, 1968, pp. 567—582.

CHAPTER 3

REGIONAL AND RACIAL CHANGES IN SCIENCE ACHIEVEMENT, 1969-73

The achievement trends are displayed in Exhibits 1 through 12. The point on the left-hand side of each graph represents the mean regional achievement relative to the nation in 1969-70. The point on the right-hand side of each graph represents the mean achievement for 1972-73. The slope of the lines depicts the direction (up or down) and rate of change in performance between the two assessments.

The data show a consistent decline in achievement at all three ages in the NCW region.[1] An average of 1.9% fewer 9-year-olds, 2.2% fewer 13-year-olds and 3.2% fewer 17-year-olds could answer a science question correctly in 1972—73 than could do so in 1969—70 ($p<.01$ at each age). In the Southeast, on the other hand, there was virtually no change in achievement at ages 9 and 13. At age 17 achievement declined 1.6 percentage points ($p<.05$). Given the declines in the rest of the nation, Southeastern 9-, 13- and 17-year-olds showed a relative improvement in achievement ($p<.05$). However, it should be noted that NCW students consistently performed at a higher level than their counterparts in the Southeast.

Black and White Achievement

The average percentage of both blacks and whites correctly answering a science question declined between 1969—70 and 1972—73

EXHIBIT 1. Mean Achievement: Region, Age 9

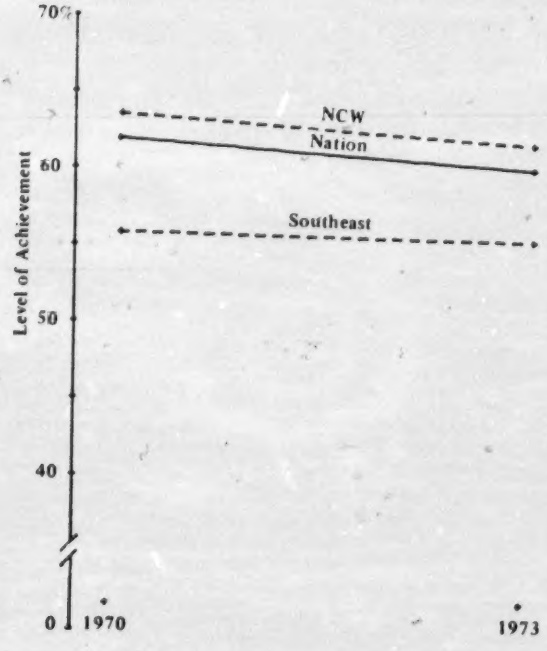


EXHIBIT 2. Mean Achievement: Region, Age 13

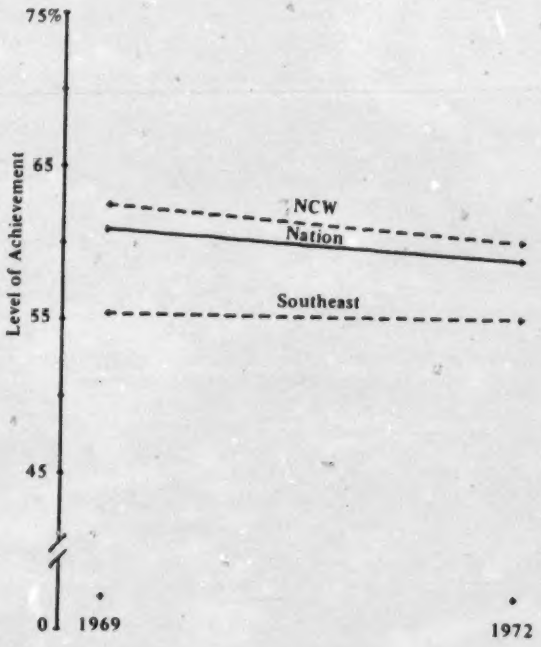


EXHIBIT 3. Mean Achievement: Region, Age 17

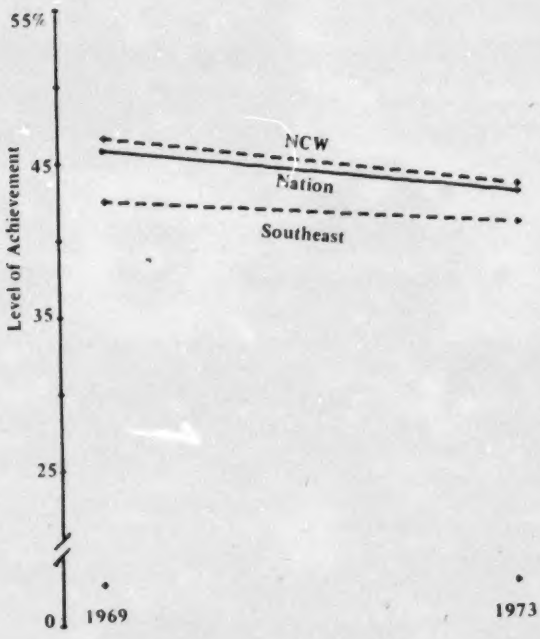
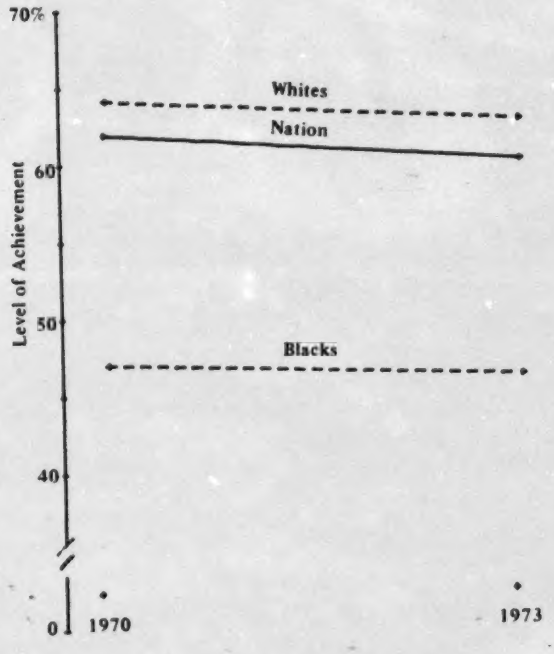


EXHIBIT 4. Mean Achievement: Race, Age 9



(Exhibits 4—6). Average black achievement declines were smaller than those of whites at ages 9 and 17; however, at age 13 they were greater. The percentage of 9-year-old blacks in the nation answering a question correctly declined 0.9 percentage points. However, the probability that a decline this large would be observed even if there was no change in achievement for the black population at age 9 is relatively high ($p<.32$). The white decline at age 9 was 1.5 percentage points ($p<.01$).

At age 17, black achievement declined 1.9 percentage points ($p<.03$) while the percentage of whites answering a question correctly declined 2.7 points ($p<.01$). The percentage of 13-year-old blacks answering a question correctly declined 3.2 points on the average ($p<.01$), compared to only 1.7 percentage points for whites ($p<.01$).

Regional Achievement for Blacks

The most encouraging change in achievement occurred at age 9 for Southeastern blacks. Al-

EXHIBIT 5. Mean Achievement: Race, Age 13

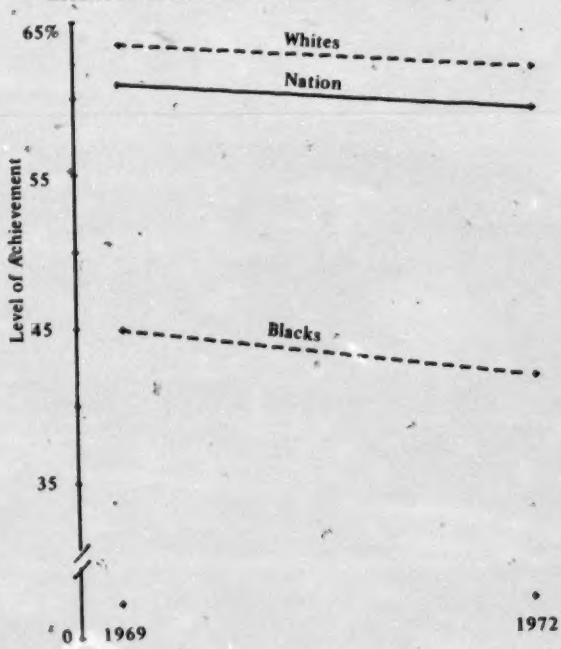


EXHIBIT 6. Mean Achievement: Race, Age 17

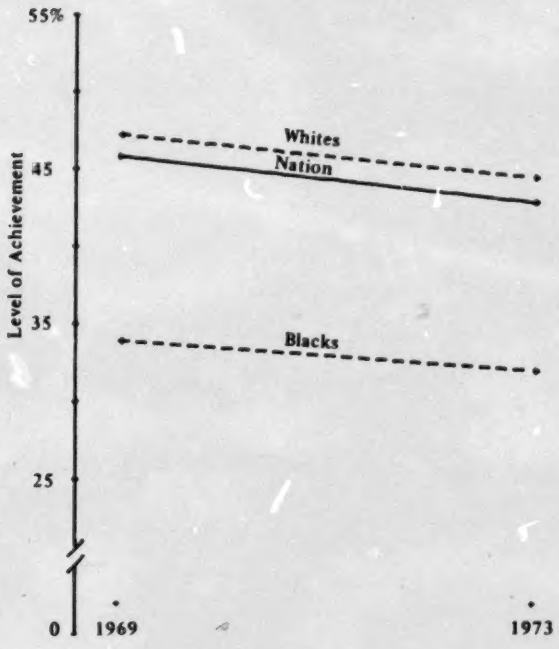
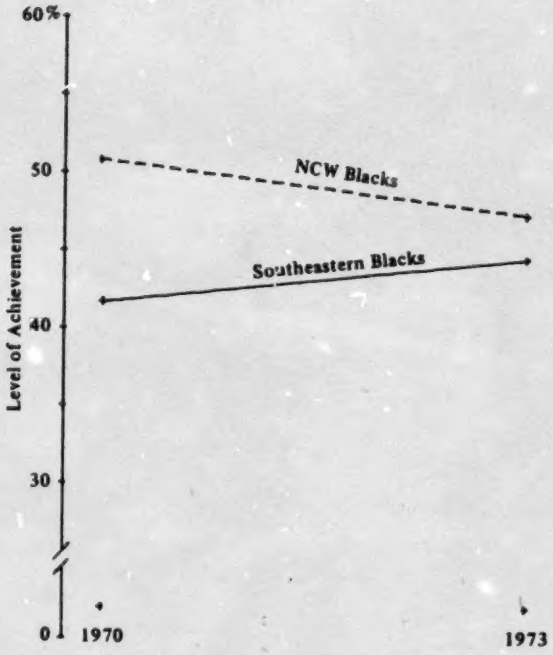
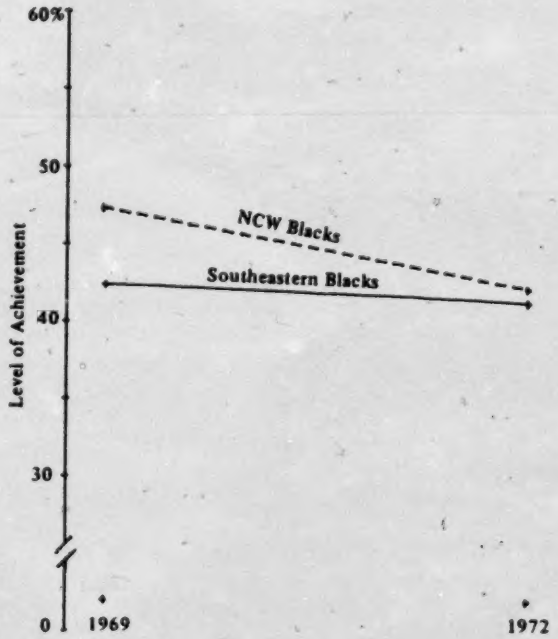


EXHIBIT 7. Mean Achievement: Blacks by Region, Age 9



though at least some decline was evident for all the other groups at all three age levels, 9-year-old black achievement in the Southeast improved (Exhibit 7). An average of 2.8% more Southeastern blacks at age 9 correctly answered a science question in 1973 than could do so in 1970 ($p<.01$). In contrast, the achievement of NCW blacks at the same age declined 3.5 percentage points ($p<.01$). The smaller national decline for 9-year-old blacks is attributable to gains in the Southeast. At age 13 an average of 1.1% fewer blacks answered a question correctly in the second assessment ($p<.27$). However, the percentage of NCW blacks at this age able to answer a question correctly dropped 5.1 points ($p<.01$) (Exhibit 8). The achievement of 17-year-old blacks in the Southeast declined 1.2 percentage points ($p<.36$), compared to a decline of 2.5 percentage points ($p<.05$) for 17-year-old blacks in the NCW region (Exhibit 9).

EXHIBIT 8. Mean Achievement: Blacks by Region, Age 13



Regional Achievement for Whites

While fewer Southeastern whites at all three ages could correctly answer science questions

EXHIBIT 9. Mean Achievement: Blacks by Region, Age 17

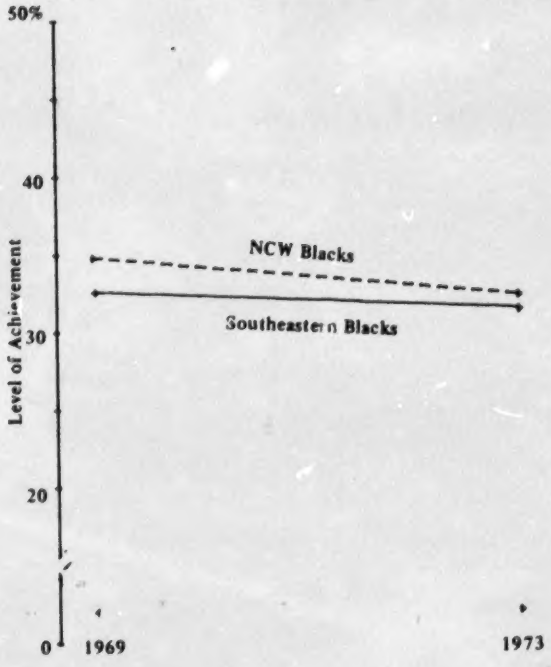
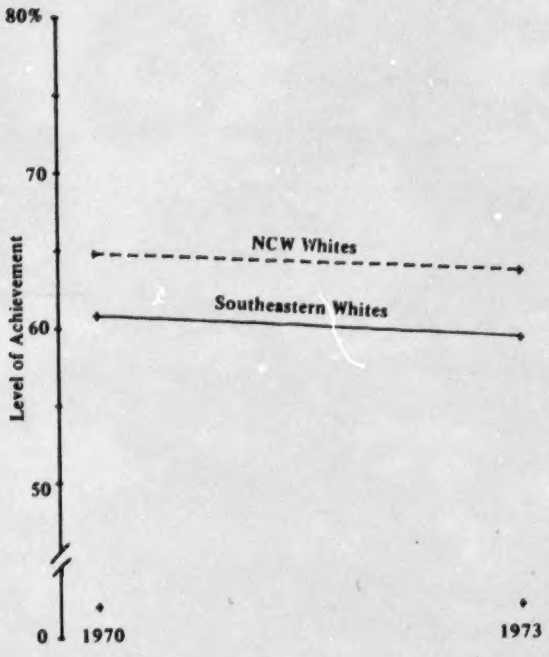


EXHIBIT 10. Mean Achievement: Whites by Region, Age 9



in 1972-73 than in 1969-70, generally speaking Southeastern whites showed no evidence of greater declines than whites in the rest of the country.

An average of 1.6% fewer white Southeasterners at age 9 correctly answered a science question in the second assessment ($p<.21$) compared to 1.3% fewer NCW whites at this age ($p<.03$) (Exhibit 10). At age 13, 1.2% fewer Southeastern ($p<.31$) and 1.8% fewer NCW whites ($p<.01$) correctly answered a given question in 1972 than could do so in 1969 (Exhibit 11). Among 17-year-old whites the decline was 1.2% for Southeasterners ($p<.18$) and 3.0% ($p<.01$) for the NCW (Exhibit 12).

EXHIBIT 11. Mean Achievement: Whites by Region, Age 13

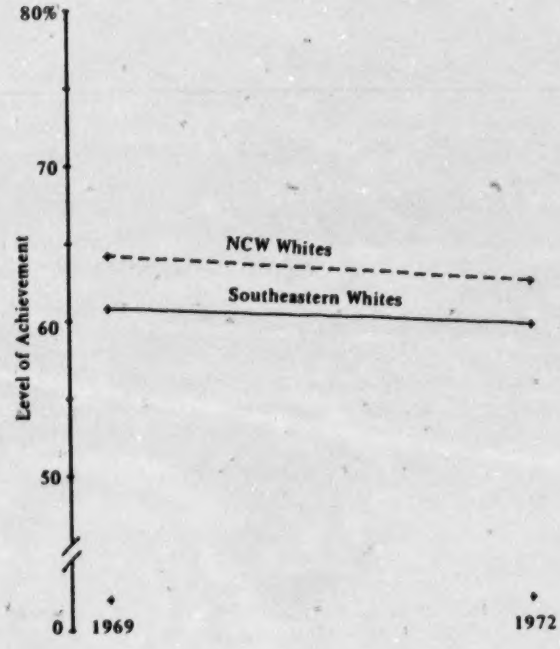
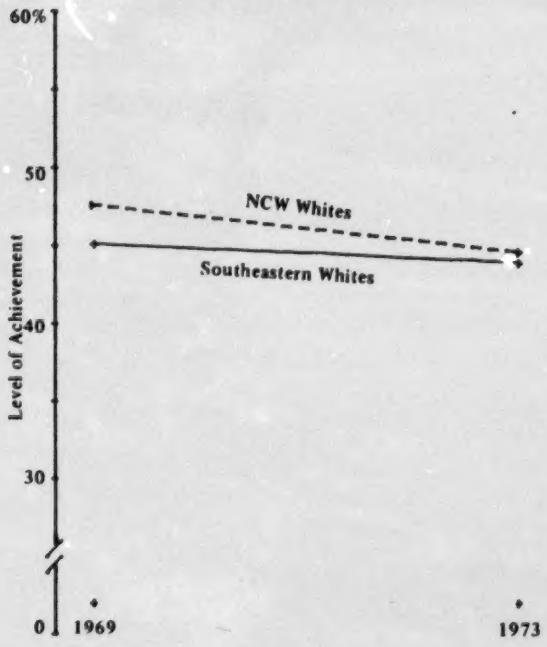


EXHIBIT 12. Mean Achievement: Whites by Region, Age 17



A summary of regional differences in achievement for both blacks and whites is presented below.

Differences in Achievement, Race by Region

	Age	Blacks	Whites
Southeast			
	9	+2.8	-1.6
	13	-1.1	-1.2
	17	-1.2	-1.2
NCW			
	9	-3.5	-1.3
	13	-5.1	-1.8
	17	-2.5	-3.0

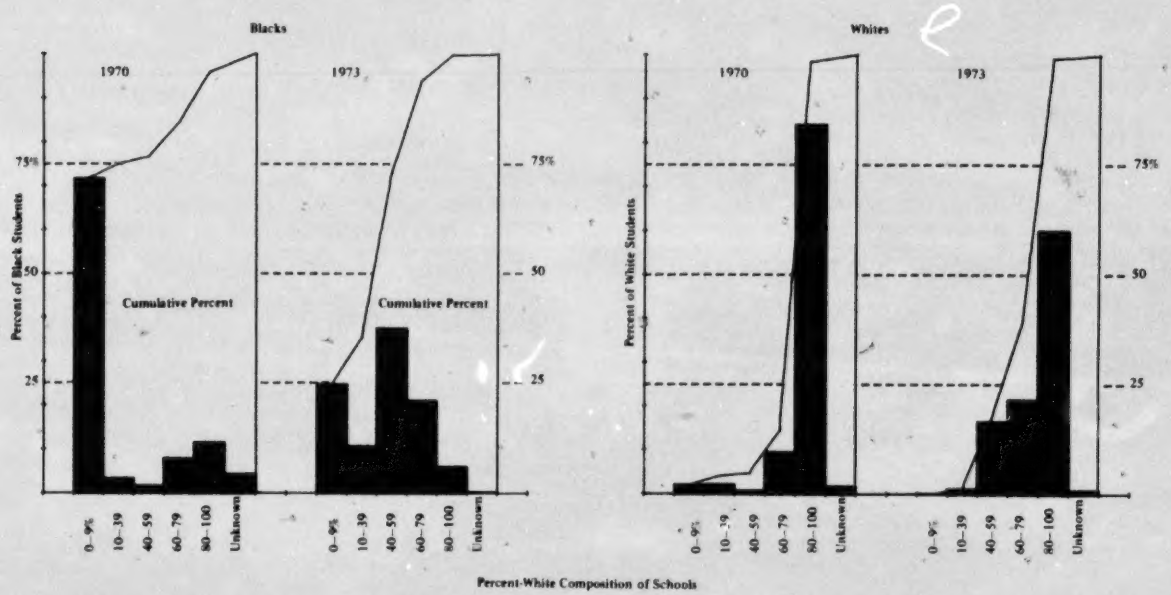
[1] The 95%-confidence interval for all achievement changes displayed in Exhibits 1—12 appear in Appendix B.

CHAPTER 4

PATTERNS IN THE RACIAL COMPOSITION OF SCHOOLS IN THE SOUTHEAST AND NCW REGIONS, 1969–73

The major federal educational goal of the last two decades has been to provide equality of educational opportunity for all students. The main effort in this area has been the desegregation of our nation's schools.[1] While an evaluation of the effectiveness of the desegregation effort cannot and should not be based solely on achievement measures, the impact of desegregation on student achievement has remained an important educational and political issue about which we have surprisingly little solid information. The path-breaking report on Equality of Educational Opportunity (EEOS) in 1966, often referred to as the Coleman report, and the reanalyses of it provided the first national-level data on this issue. However, the National Assessment of Educational Progress (NAEP) data presented here are the only national-survey data collected on a *continuing* basis. Unlike EEOS, the NAEP data permit the examination of changes in achievement and changes in the racial composition of schools. Because National Assessment is a continuing, coordinated project and not a one-time effort like EEOS, it provides the opportunity to gather trend data and compare these changes.

EXHIBIT 13. Percent of Southeastern Blacks and Whites, Age 9, in Schools of Different Percent-White Composition, 1970 and 1973



The school composition and achievement data found in the remainder of this study are from the National Assessment of Educational Progress science assessments and are based on the percentages of white students reported in the principal's questionnaire in the 1969—70 and 1972—73 school years.[2] These data are consistent with the recently published Coleman study based on data collected by the Office of Civil Rights of the Department of Health, Education, and Welfare.[3] After establishing the trends within each region over time using the National Assessment data, the remainder of this section compares and contrasts the regional differences in the black-white composition of schools in the Southeast and NCW in both assessment years. While changing racial composition is only one of many factors possibly related to changes in science achievement and therefore must not be regarded as offering proof of cause and effect, it is nevertheless an important addition to the information we have.[4]

Trends in the Southeast

Major shifts in the black-white composition of schools occurred in the Southeast between the 1969—70 and 1972—73 school years for both black and white students.[5] In 1970 the Southeastern schools were still segregated to a large extent, with approximately 70% of the black students attending schools that had fewer than 10% white students (Appendix C, Table C1). On the other hand, about 85% of the white students attended schools that were between 80 and 100% white in composition (Appendix C, Table C2). Three years later the picture looked quite different. In 1972—73 approximately 20% of the black students were in schools with fewer than 10% white students, and approximately 50% of the Southeastern blacks went to schools that were at least half white. The spread of black students throughout the schools, which in 1969—70 were overwhelmingly white, is reflected in Exhibits 13, 14 and 15. By 1973 most white and black students in the Southeast were attending racially mixed schools.

Trends in the NCW

Exhibits 16—18 show that changes in the racial composition of schools in the NCW region

EXHIBIT 14. Percent of Southeastern Blacks and Whites, Age 13, in Schools of Different Percent-White Composition, 1969 and 1972

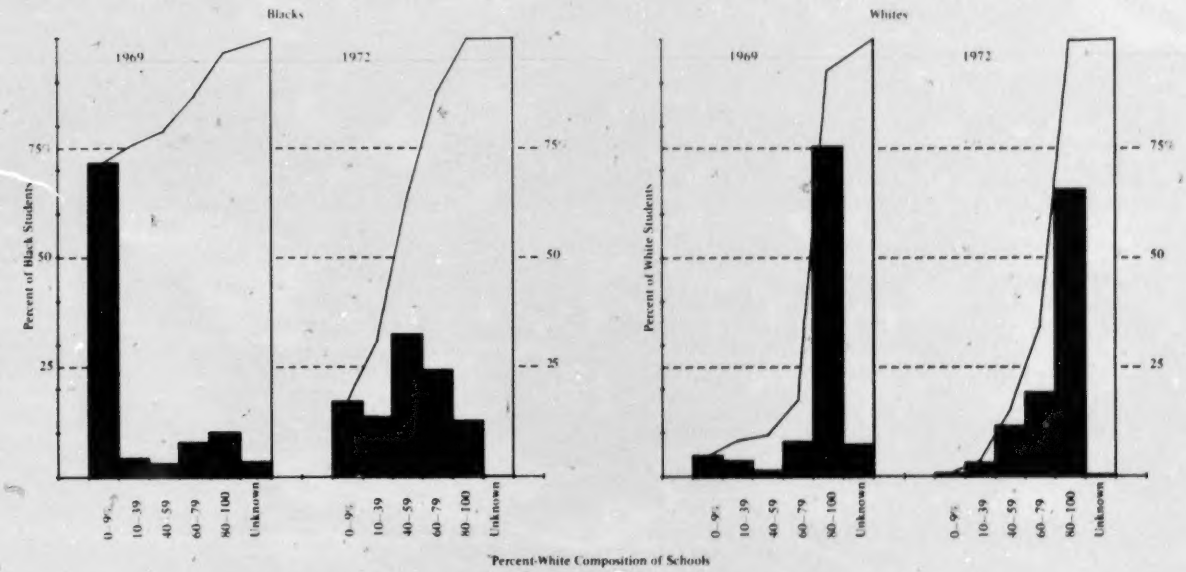


EXHIBIT 15. Percent of Southeastern Blacks and Whites, Age 17, in Schools of Different Percent-White Composition, 1969 and 1973

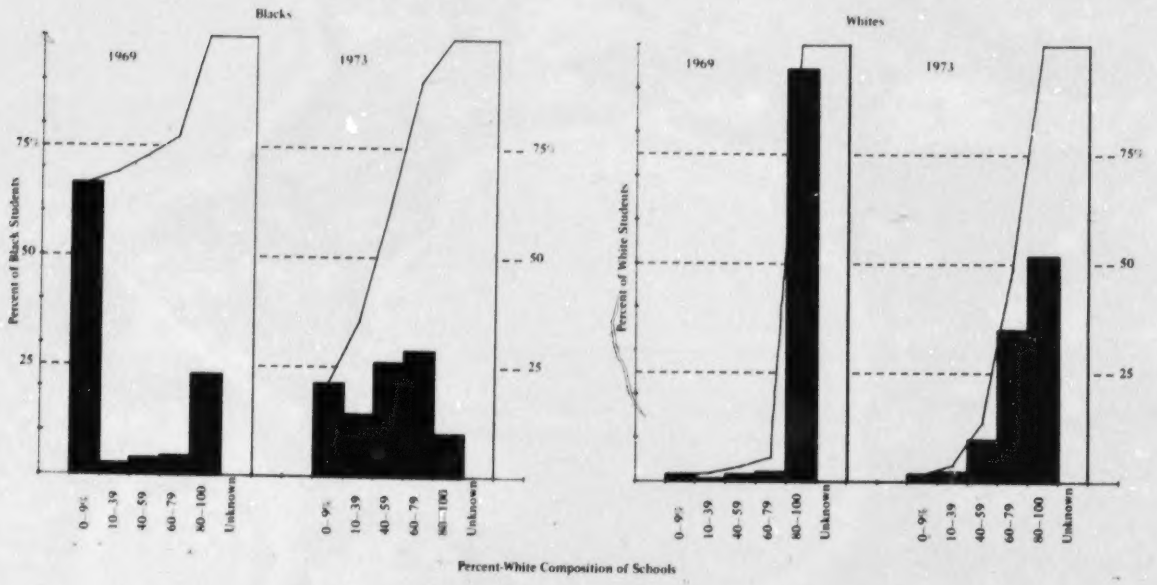


EXHIBIT 16. Percent of NCW Blacks and Whites, Age 9, in Schools of Different Percent-White Composition, 1970 and 1973

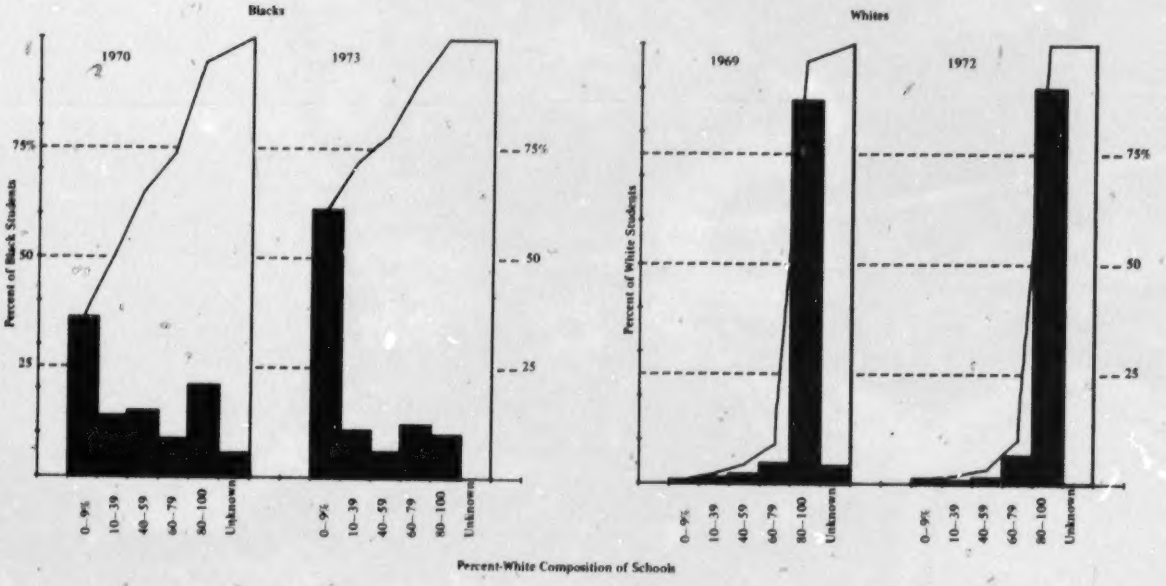
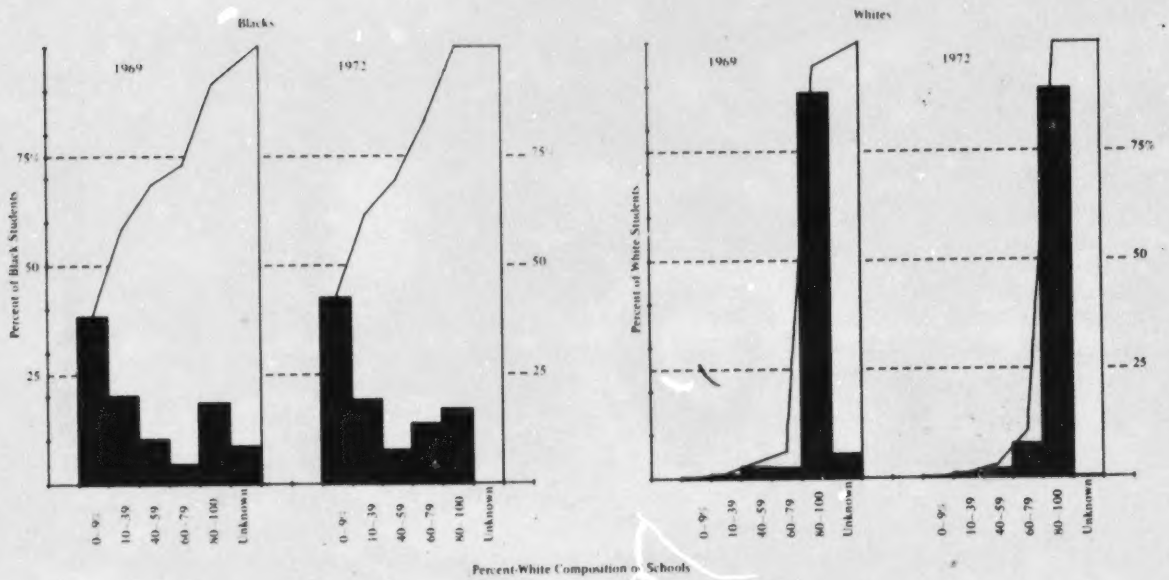


EXHIBIT 17. Percent of NCW Blacks and Whites, Age 13, in Schools of Different Percent-White Composition, 1969 and 1972



between 1969 and 1973 tended to be small except at age 9 (Appendix C, Tables C1 and C2). There was a large increase in the percentage of black students at age 9 attending schools with fewer than 10% white students between 1970 and 1973. In 1970 36.2% of the NCW blacks were in 0—9% white schools. By 1973 the percentage had increased by two-thirds to 61.1%. This change suggests that elementary schools in the NCW were more segregated in 1973 than they had been in 1970 (Exhibit 16). At ages 13 and 17 the changes, while small, also are in the direction of increasing school segregation. Approximately 90% of the white students at all three ages attended schools that were at least 80% white in both 1969—70 and 1972—73 (Exhibits 17 and 18).

Regional Differences

Another way of looking at trends in the racial composition of the schools is to compare the two regions within a given year. The data in Exhibits 19 through 21 is the same as found in Exhibits 13 through 18; however, it is organized to emphasize a different perspective on the data.

Comparing the Southeast to the NCW emphasizes differences in the black-white composition of schools for these regions in 1969—70 and 1972—73. While the NCW schools were far less segregated than the Southeastern schools in 1969—70, in 1972—73 there was a change in this situation. The percentage of Southeastern black students attending schools 40—59% white in composition was greater than in the rest of the nation in 1972 and 1973 (Exhibits 19 through 21).

Based on averages over all three age levels,[6] the following observations can be made:

1. In 1969—70 about twice the percentage of Southeastern blacks (70%) attended 0—9% white schools as did NCW blacks (35%). In 1972—73 a complete reversal

EXHIBIT 18. Percent of NCW Blacks and Whites, Age 17, in Schools of Different Percent-White Composition, 1969 and 1973

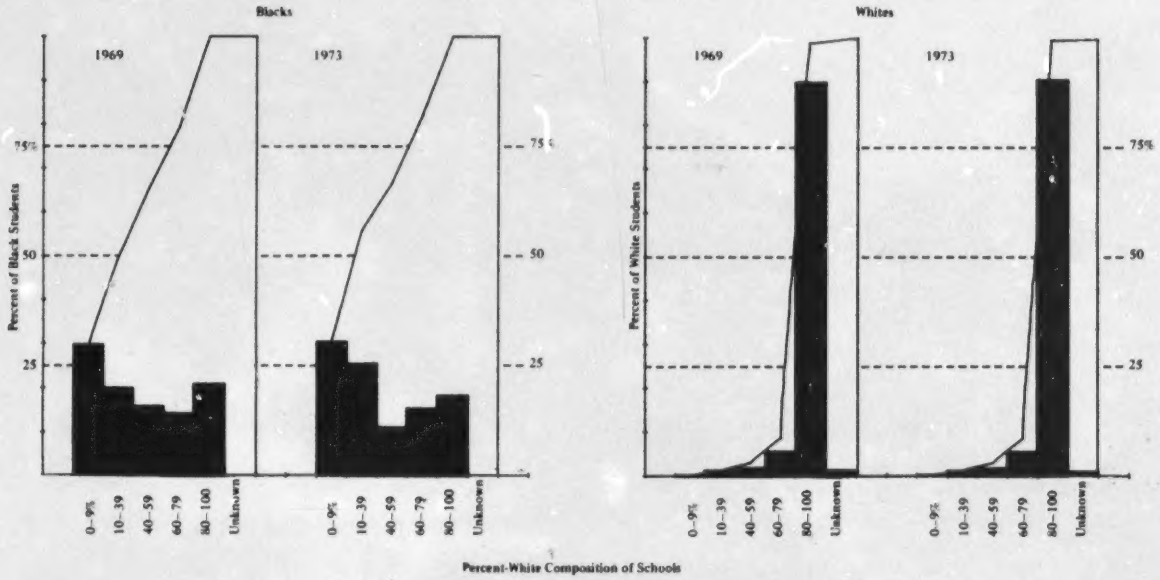


EXHIBIT 19. Percent of Black and White Students, Age 9, in Schools of Different White Composition. A Comparison of Regional Differences in 1970 and 1973

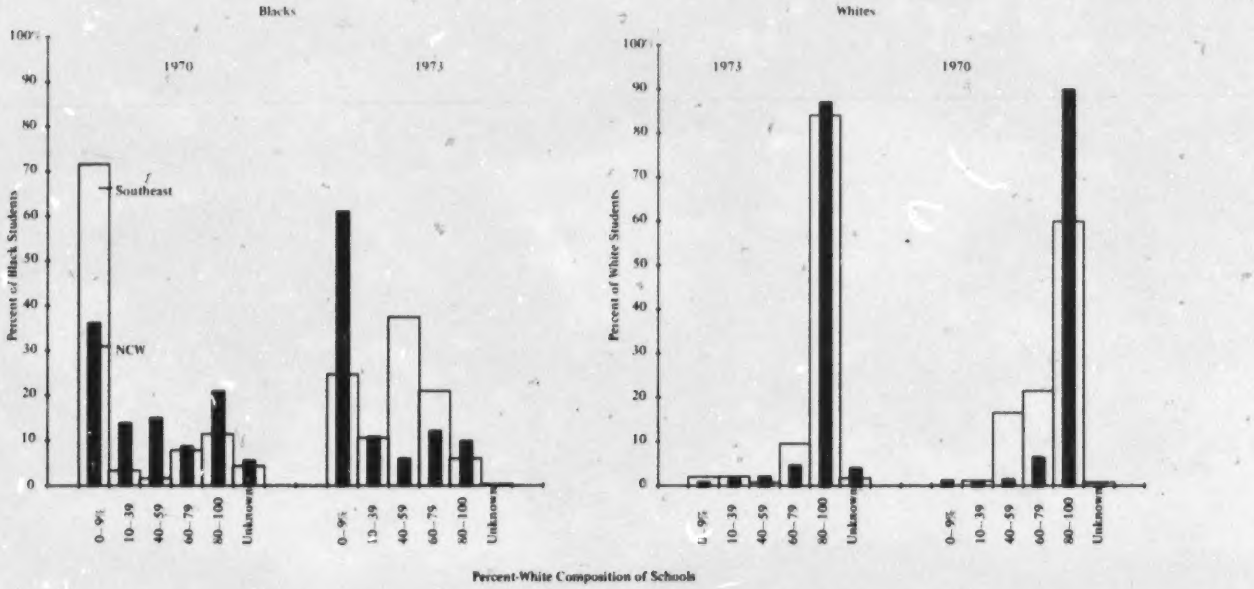


EXHIBIT 20. Percent of Black and White Students, Age 13, in Schools of Different White Composition. A Comparison of Regional Differences in 1969 and 1972

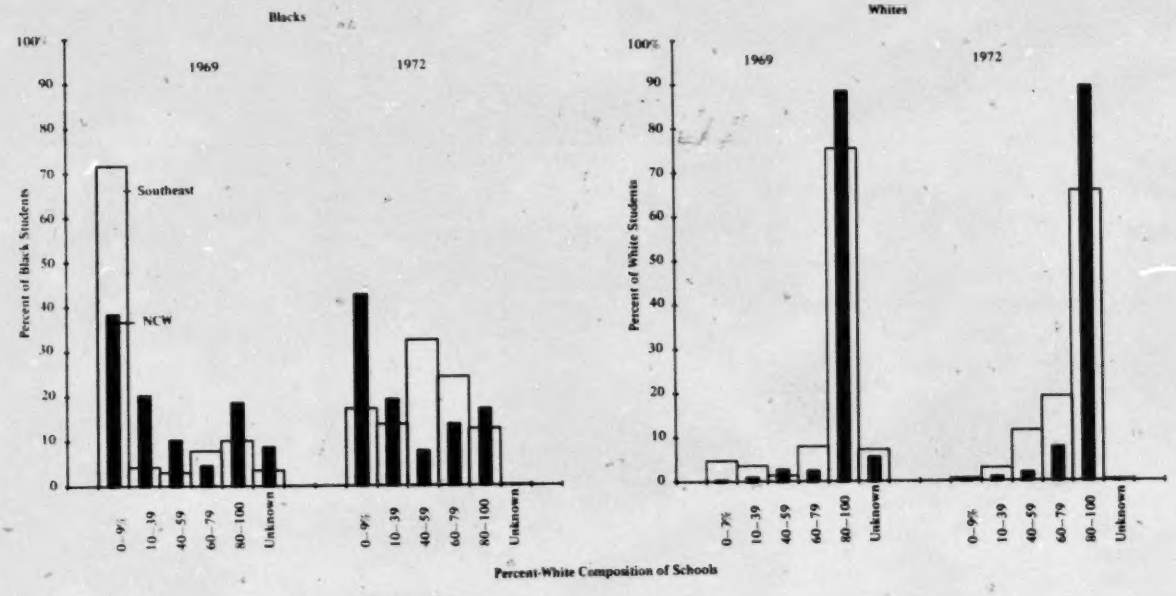
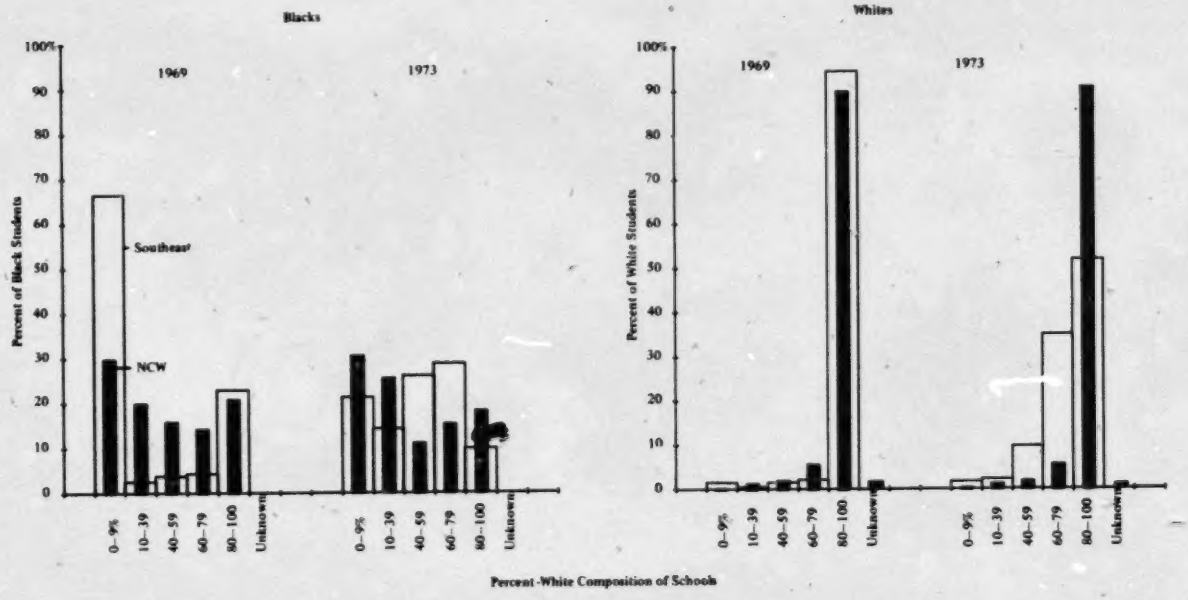


EXHIBIT 21. Percent of Black and White Students, Age 17, in Schools of Different White Composition. A Comparison of Regional Differences in 1969 and 1973



occurred. More than twice the percentage of NCW blacks (45%) attended 0—9% white schools than did Southeastern blacks (21%).

2. From 1969 to 1973 the percentages of white students in the Southeast attending 80—100% white schools dropped from 85% to 60%. In the NCW region the percentages of white students changed little. However, this would be expected given the smaller percentage of blacks in the NCW region relative to the Southeast (see Appendix A, Table A1 for the percentage in both regions).

By 1972—73 the percentages of both black and white students attending racially mixed schools was far greater in the Southeast than in the rest of the nation.

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[1] *Twenty Years After Brown: Equality of Educational Opportunity*. A report of the U.S. Commission on Civil Rights, March 1975, p. 90. The essential purpose of desegregation is "to provide the equal educational opportunity that segregation inherently denies and to permit all pupils to develop the understanding and appreciation of each other that inevitably will result in a more equitable society for all Americans."

[2] As part of a longer National Assessment questionnaire, the principals of each school were asked approximately what percentage of students in their school was white. This information was then collapsed into the following six categories: 0—9%, 10—39%, 40—59%, 60—79%, 80—100%, and unknown.

[3] Coleman et al., *Trends in School Segregation 1969—1973*. (Washington, D.C., The Urban Institute, 1975).

[4] No research to date in this area has proven a definitive relationship between academic achievement and the racial composition of schools. Given the enormity of the political, moral and technical problems involved in the desegregation issue, it is highly doubtful that any research ever will. Two comprehensive overviews of the desegregation-academic achievement research to date are found in Nancy H. St. John, *School Desegregation: Outcomes for Children* (New York: John Wiley and Sons, 1975), pp. 16—41, and Meyer Weinberg, "The Relationship Between School Desegregation and Academic Achievement: A Review of the Research," *Law and Contemporary Problems*, 39, No. 2, Spring 1975, pp. 240—270. An empirical demonstration of the problems inherent in inferring causal relations from survey data is given by Daniel F. Luecke and Noel F. McGinn, "Regression Analyses and Educational Production Functions: Can They Be Trusted?" *Harvard Educational Review*, 45, No. 3, August 1975, pp. 325—50. A discussion of the philosophical and sociological issues raised by using social science evidence to determine educational policy is found in Henry M. Levin, "Education, Life Chances and the Courts: The Role of Social Science Evidence," *Law and Contemporary Problems*, 39, No. 2, Spring 1975, pp. 217—40.

[5] For a discussion of the rapid transformation in the South from an essentially dual school system in the spring of 1970 to a unitary one by the fall of 1970, see Frederick Mosteller and Daniel P. Moynihan, eds., *On Equality of Educational Opportunity* (New York: Random House, 1975), pp. 58—63.

[6] Averages are derived from Appendix C, Tables C1 and C2.

CHAPTER 5

REGIONAL COMPARISONS OF SCIENCE ACHIEVEMENT AND RACIAL COMPOSITION OF THE SCHOOLS

This section documents student achievement levels by the racial composition of the schools that they actually attended in 1969–70 and 1972–73.

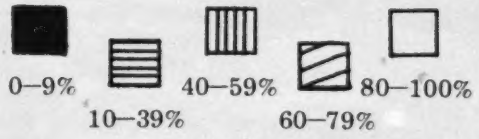
Exhibits 22 through 33 chart achievement in 1969–70 and 1972–73 against the distribution of students in schools of various racial composition. The following information can be obtained by using these graphs:

1. For a given assessment year:
   a. Achievement for students in 0–9, 10–39, 40–59, 60–79 and 80–100% white schools.
   b. The distribution of students in the five categories of percent white.
   c. A visual representation of the relationship between achievement and racial composition by region.

2. For two assessment years:
   a. A comparison of achievement over time in the various percent-white categories.
   b. A comparison of the distribution of students over time in the various percent-white categories.
   c. A visual representation of the changing relationship between achievement and racial composition by region.

The bars are coded to simplify the comparisons across time. The following symbols are used on all the graphs:

Percent-White Categories



The vertical axis displays the mean percentage of students correctly answering a question. The taller the bar, the greater the mean percentage of students correctly answering a question. The horizontal axis displays the distribution of students within the five categories of percent white. The wider the bar, the greater the percentage of students in that category. The text accompanying each graph will point to important shifts in both achievement and school composition.

Southeastern Blacks

An examination of Exhibits 22, 23 and 24 leads to several general observations:

1. In 1969–70 approximately 70% of the black students in the Southeast attended 0–9% white schools. In 1972–73 70% of the black students were evenly spread out among four categories of schools. There were very large increases in the percentage of black students attending schools in the 10–39, 40–59 and 60–79% white categories, while the per-

EXHIBIT 22. Level of Southeastern Black Achievement, Age 9, in Relation to Percent-White Composition of the Schools, 1970 and 1973

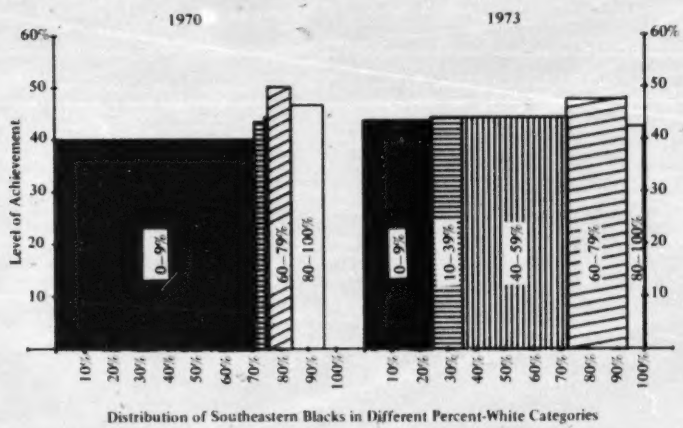


EXHIBIT 23. Level of Southeastern Black Achievement, Age 13, in Relation to Percent-White Composition of the Schools, 1969 and 1972

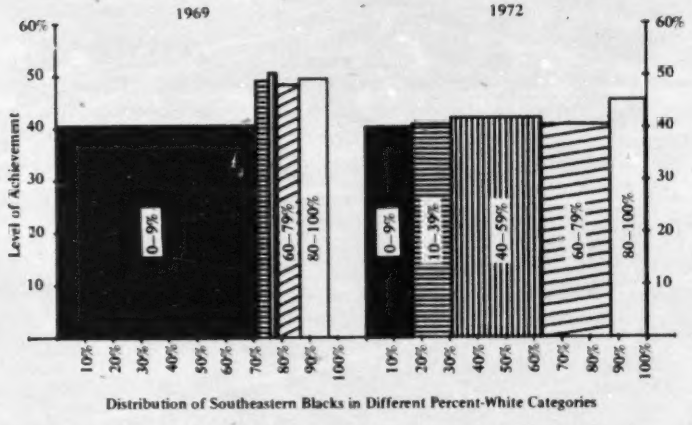
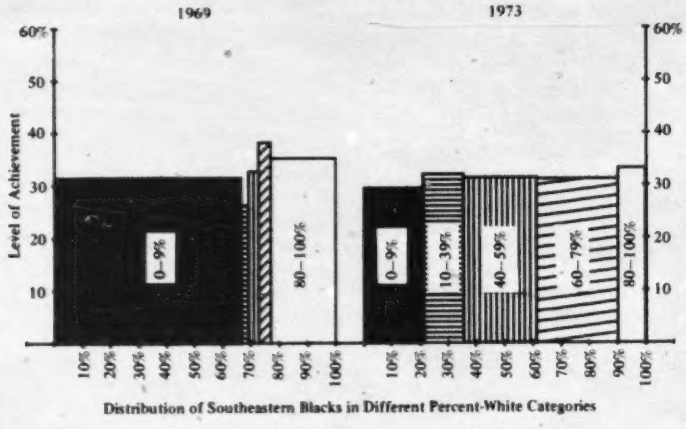


EXHIBIT 24. Level of Southeastern Black Achievement, Age 17, in Relation to Percent-White Composition of the Schools, 1969 and 1973



centage of students in the 0—9% white category sharply declined.

2. At age 9 (Exhibit 22) there is a steady increase in achievement from the 0—9% white to the 60—79% white category in both 1970 and 1973. However, given the large increases in the percentage of students in the 10—39, 40—59 and 60—79% white categories in 1973, a greater percentage of Southeastern black 9-year-olds were achieving better in 1973 than did so in 1970.

3. At ages 13 and 17 the same general patterns of racial composition changes occur, but achievement gains are not generally observed (Exhibits 23 and 24). However, at age 17 blacks attending schools that were 10—39% white showed achievement gains. A general equalization of achievement among students in various percent-white categories occurs in 1972—73. Within certain percent-white categories showing large increases of students in 1972—73, achievement dropped from the 1969 level. Because of the small size of these categories in 1969, comparisons between 1969 and 1972—73 are probably not reliable.

NCW Blacks

The relationship between achievement and school composition is consistent for NCW blacks at ages 13 and 17. An examination of Exhibits 26 and 27 shows the following general patterns:

1. The distribution of black students ages 13 and 17 in the various school categories was about the same in 1972—73 as it was in 1969. If anything, blacks were attending schools with fewer white students by 1973.

2. Achievement levels in almost all of the percent-white school categories went down. The one exception was the 80—100% white category at age 17. Although none of the changes in achievement in these categories are statistically significant, the persistence of these declines tends to substantiate a general downward trend (Appendix A, Table A3). At age 13, there were declines of 7.4 percentage points ($p<.01$) in the 10—39% white category and 7.6 percentage points ($p<.01$) in the 80—100% white category that pinpoint the large overall decline (5.1 percentage points) for 13-year-old blacks in the NCW.

At age 9 (Exhibit 25) the pattern in the NCW was somewhat different. There was a large increase in the percentage of 9-year-old blacks attending 0—9% white elementary schools in 1973. The achievement levels of these blacks was 2.5 percentage points above that of the 9-year-old blacks in 1970 that attended highly segregated schools ($p<.30$). The gains for this age level may be due to the large increase in the percentage of students in the 0—9% white category. In the 40—59, 60—79 and 80—100% white categories, the declines in achievement were all between 6 and 7 percentage points ($p<.02$).

Southeastern Whites

Based on Exhibits 28, 29 and 30 the following general observations can be made about the relationship of Southeastern white achievement and the racial composition of schools:

1. Although the percentage of white students attending school with more than 20% black students increased appreciably at all three ages, differences between achievement levels were not statistically significant. White students

EXHIBIT 25. Level of NCW Black Achievement, Age 9, in Relation to Percent-White Composition of the Schools, 1970 and 1973

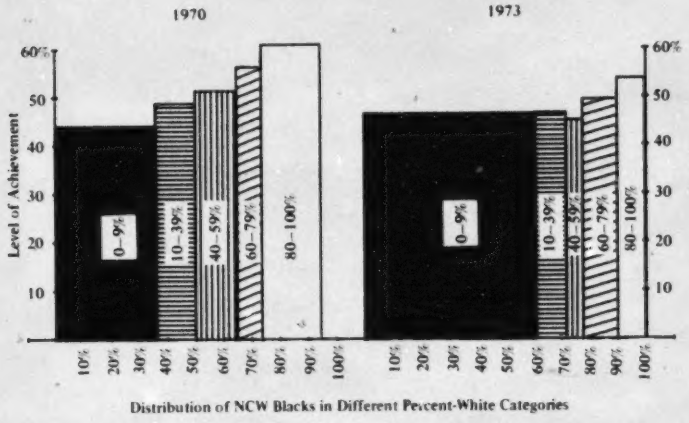


EXHIBIT 26. Level of NCW Black Achievement, Age 13, in Relation to Percent-White Composition of the Schools, 1969 and 1972

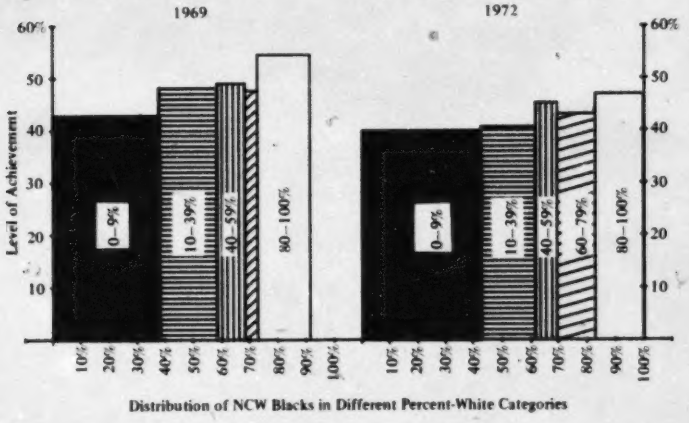


EXHIBIT 27. Level of NCW Black Achievement, Age 17, in Relation to Percent-White Composition of the Schools, 1969 and 1973

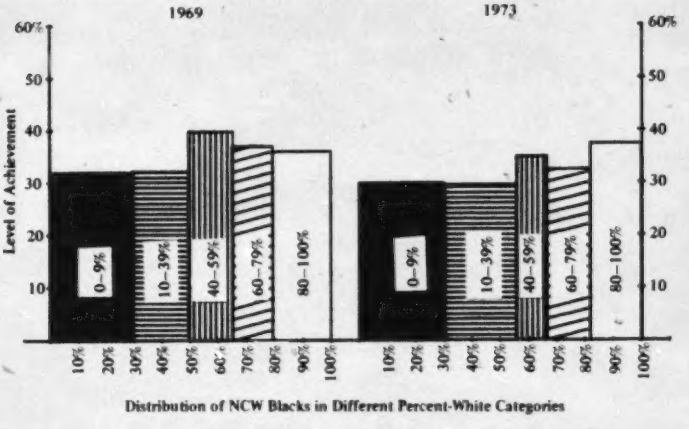


EXHIBIT 28. Level of Southeastern White Achievement, Age 9, in Relation to Percent-White Composition of the Schools, 1970 and 1973

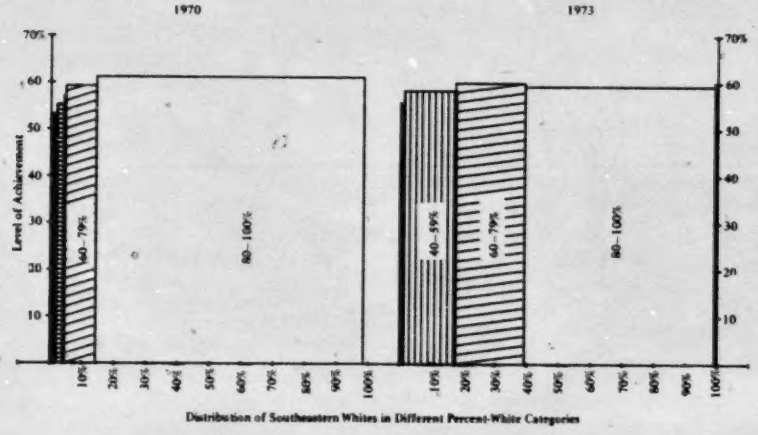


EXHIBIT 29. Level of Southeastern White Achievement, Age 13, in Relation to Percent-White Composition of the Schools, 1969 and 1972

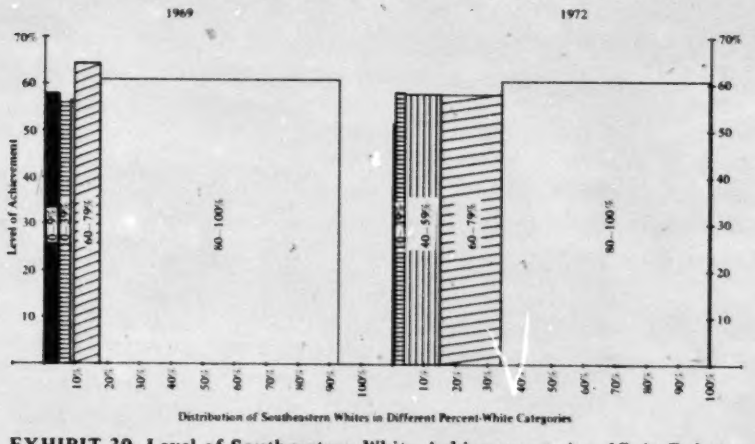
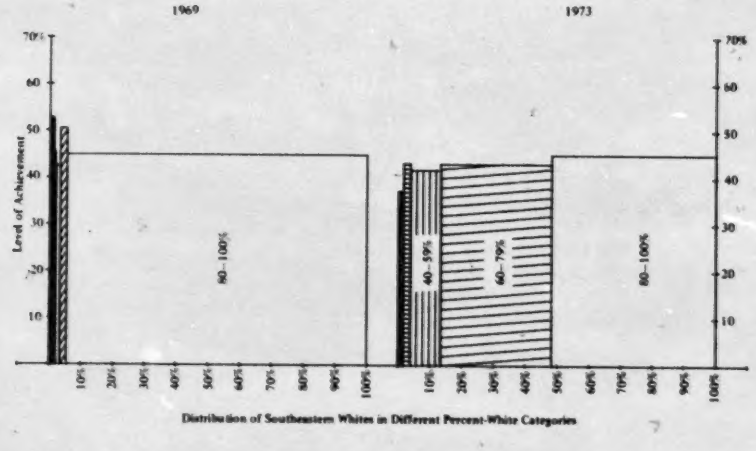


EXHIBIT 30. Level of Southeastern White Achievement, Age 17, in Relation to Percent-White Composition of the Schools, 1969 and 1973



did decline some in achievement, but the declines were generally smaller than white declines in the NCW region.

2. At age 9 over 80% of the white students in 1970 attended 80—100% white schools. In 1973 9-year-old whites were more evenly spread across the upper three categories (80—100, 60—79 and 40—59% white) without any appreciable loss in achievement (Exhibit 28).

3. At ages 13 and 17 the average declines in achievement were less than the NCW averages. At both age levels there was a large increase of students attending schools that were 60—79% white. Because of this shift in the percentage of students in 60—79% white schools, the achievement of students attending them in 1972—73 is most comparable to the achievement of students in schools that were 80—100% white in 1969—70. There was virtually no change in the achievement levels for students attending 80—100% white schools. These data suggest that desegregation had no more than a minimally negative effect on white achievement at ages 13 and 17. As was the case with blacks in the Southeast at these ages, there appears to be a general equalization of achievement among students in various percent-white categories but no severe achievement decline.

NCW Whites

Because of the extremely high percentage (approximately 90%) of white students at all three ages in the 80—100% white category in both 1969—70 and 1972—73, more detailed analysis of achievement results by the other percent-white categories cannot yield any further reliable clarification of the results (Exhibits 31 through 33).

Conclusion

When science achievement is examined in relation to the racial composition of schools, both black and white students generally achieve at higher levels as the proportion of white students in the school increases. In almost all cases the best performance levels for both races come in schools in which the majority of students are white.[1] (See Appendix A, Tables A3 through A6 for more detailed data.)

Although the patterns found in our data confirm the fact that blacks in majority-white schools are performing better and that whites do not perform substantially worse in moderately desegregated schools, caution should be taken not to assume that these patterns are due *only* to the racial composition of the schools. Changes in the racial composition of schools may beneficially alter the relationship between the socioeconomic and educational variables that affect achievement. While other investigations suggest that socioeconomic variables have a strong equalizing effect on achievement, direct cause-and-effect relationships between any of these various factors have not been established.[2]

The relationship between changes in school racial composition and changes in academic achievement are, in general, confounded with the accompanying changes in other variables and are not consistent from one age to another. However, in the Southeast black achievement at age 9 did improve, and at ages 13 and 17 there was a trend toward equalization of black achievement among percent-white categories. Furthermore, the achievement levels of white Southeastern 9-year-olds in schools from 40 to 100% white did not change appreciably between 1970 and 1973 although significantly more of those students were attending the 40—59 and 60—79% white schools by 1973.

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[1] The general conclusions found here are corroborated by David J. Armor, "School and Family Effects on Black and White Achievement: A Re-examination of the USOE Data," in *On Equality of Educational Opportunity*, eds. Frederick Mosteller and Daniel P. Moynihan (New York: Random House, 1972), pp. 196—98.

EXHIBIT 31. Level of NCW White Achievement, Age 9, in Relation to Percent-White Composition of the Schools, 1970 and 1973

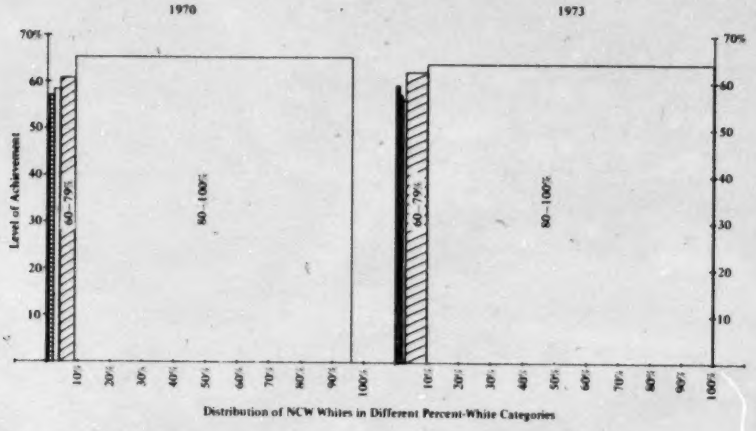


EXHIBIT 32. Level of NCW White Achievement, Age 13, in Relation to Percent-White Composition of the Schools, 1969 and 1972

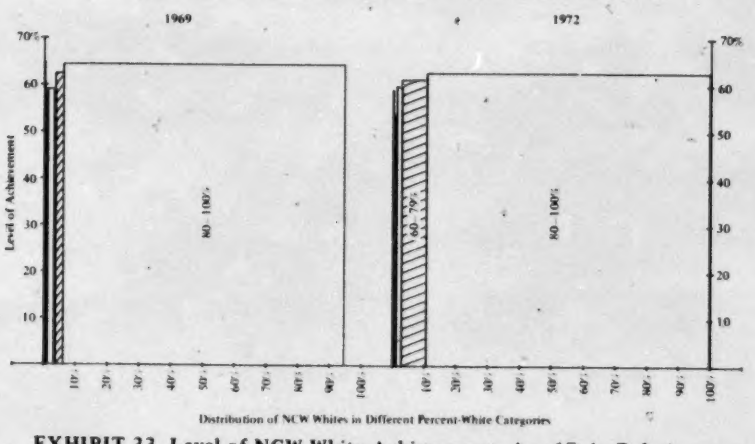
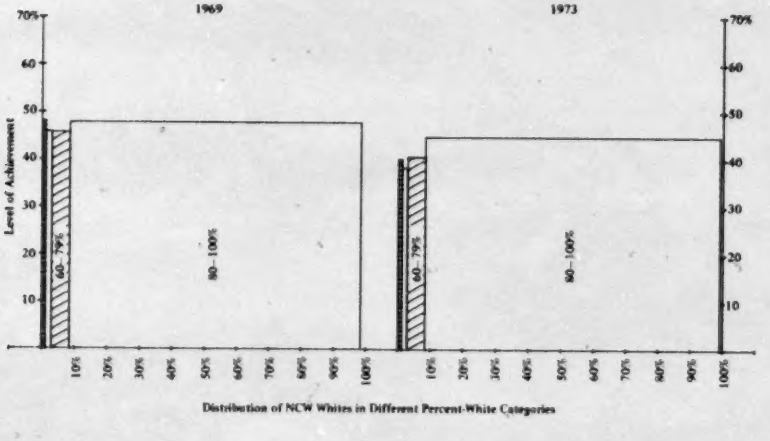


EXHIBIT 33. Level of NCW White Achievement, Age 17, in Relation to Percent-White Composition of the Schools, 1969 and 1973



[2] Armor concludes that "...while integration may be an important factor for black achievement, blacks might still never attain full achievement equality until their individual family life style catches up to that of whites." Armor, *On Equality of Educational Opportunity*, pp. 225–26. Christopher Jencks et al., *Inequality: A Reassessment of the Effects of Family and Schooling in America* (New York: Basic Books, 1972). The authors reinforce the conclusions of EEOS and its reanalysis that present variations in school resources have little to do with achievement. The EEOS, Project Talent and Plowden study in England all indicate that while certain facilities and policies sometimes have a slight relationship to cognitive achievement, the general effect of variations is slight or unpredictable.

APPENDIX A

THE CALCULATIONS OF MEANS AND MEAN DIFFERENCES

In general, if the sizes of two groups are different, the average performance of the combined groups is not obtained by simply averaging the mean performance of the two groups. Instead, the combined performance must be obtained by weighting each average group performance by the proportion of individuals in that group. At age 9 in 1970, for example, the proportion of blacks was 0.128 and the proportion of whites was 0.872. The combined 9-year-old average performance is not the simple average of 47.0% and 64.1% (Appendix A, Table A2). The national average performance is the sum of the group performances multiplied by the proportion of 9-year-olds in each of the groups:

61.9% = 0.128 (47.0%) + 0.872 (64.1%).

Further, if the group proportions change between two assessments, the relation of individual group means to the combined group mean also changes. Recognition that changes in relative proportions of groups can affect the overall performance helps to understand trends in achievement. For example, the percentages in Appendix A, Table A2 and in the proportions in Appendix A, Table A1 show that 13-year-old Southeastern blacks' and whites' average achievement declined 1.1 and 1.2 percentage points, respectively, although the average achievement of Southeastern 13-year-olds declined only 0.1 percentage point. This apparent inconsistency is caused by a shift in the proportion of blacks in the Southeast from 0.293 in 1969 to 0.236 in 1972 and is demonstrated in the following computation:

1969 Southeast average performance:
55.4% = 0.293 (42.4%) + 0.707 (60.8%).

1972 Southeast average performance:
55.3% = 0.236 (41.3%) + 0.764 (59.6%).

Difference: -0.1%.

In this computation, the Southeast performance is the sum of the Southeast black and white performance multiplied by the proportion of 13-year-olds in each group. The proportion of whites increased and the proportion of blacks decreased by 5.7%. Had the proportions remained the same, the 13-year-old performance in 1972 would have been 0.293 (41.3%) + 0.707 (59.6%) = 54.2%, and the Southeast would have also declined 1.2 percentage points instead of 0.1.

TABLE A1. Proportion of Blacks and Whites Within the Nation and Regions, 1969–73, Ages 9, 13 and 17

	Age 9		Age 13		Age 17	
	1970	1973	1969	1972	1969	1973
Nation*	1.000	1.000	1.000	1.000	1.000	1.000
Southeast†	.218	.251	.218	.238	.180	.212
NCW**	.782	.749	.782	.762	.820	.788
Blacks	.128	.154	.142	.135	.101	.127
Whites	.872	.846	.858	.865	.899	.873
Southeast						
Blacks	.265	.266	.294	.235	.206	.242
Whites	.735	.734	.706	.765	.794	.758
NCW						
Blacks	.090	.116	.100	.104	.078	.096
Whites	.910	.884	.900	.896	.922	.904

**Composed of blacks and whites only; other races omitted.*

†Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.

***Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.*

Note: As with all population characteristics, the relative proportions of blacks and whites in the population were not identical in 1969–70 and 1972–73. Therefore, it is not surprising that the nation and the Southeast and NCW regions did not have identical racial compositions in the two assessment years. Discussions of how differing compositions of a variable may affect comparisons of achievement across years are found in two papers presented at the 141st annual meeting of the American Association of the Advancement of Science, New York, January 28, 1975. See Edward C. Bryant and Morris H. Hansen, "Background Adjustments of Longitudinal Comparisons," Westat, Inc.; and Donald T. Searls, Robert C. Larson, Susan W. Sherman, "Changes in National Science Achievement: Some Analysis Problems," National Assessment of Educational Progress.

TABLE A2. Mean Achievement on Science Questions, 1969–73, Ages 9, 13 and 17
(Standard errors in parentheses)

	Age 9 (92 questions)			Age 13 (67 questions)			Age 17 (64 questions)		
Group	Mean Percent Correct 1970	Mean Percent Correct 1973	Mean Change	Mean Percent Correct 1969	Mean Percent Correct 1972	Mean Change	Mean Percent Correct 1969	Mean Percent Correct 1973	Mean Change
Nation*	61.9 (0.3)	60.0 (0.4)	-1.9 (0.5)	60.9 (0.3)	59.1 (0.3)	-1.8 (0.4)	45.8 (0.3)	42.9 (0.3)	-2.9 (0.4)
Southeast†	55.8 (0.6)	55.3 (0.8)	-0.5 (1.0)	55.4 (0.6)	55.3 (0.7)	-0.1 (0.9)	42.5 (0.6)	40.9 (0.5)	-1.6 (0.8)
NCW**	63.5 (0.4)	61.6 (0.4)	-1.9 (0.6)	62.5 (0.3)	60.3 (0.4)	-2.2 (0.5)	46.6 (0.3)	43.4 (0.4)	-3.2 (0.5)
Blacks	47.0 (0.8)	46.1 (0.4)	-0.9 (0.9)	44.9 (0.6)	41.7 (0.5)	-3.2 (0.8)	33.9 (0.7)	32.0 (0.6)	-1.9 (0.9)
Whites	64.1 (0.4)	62.6 (0.4)	-1.5 (0.6)	63.5 (0.3)	61.8 (0.4)	-1.7 (0.5)	47.2 (0.3)	44.5 (0.3)	-2.7 (0.4)
Southeast Blacks	41.7 (0.6)	44.5 (0.5)	+2.8 (0.8)	42.4 (0.8)	41.3 (0.6)	-1.1 (1.0)	32.6 (1.1)	31.4 (0.7)	-1.2 (1.3)
NCW Blacks	50.8 (1.2)	47.3 (0.6)	-3.5 (1.3)	47.3 (0.8)	42.2 (0.9)	-5.1 (1.2)	34.8 (1.0)	32.3 (0.8)	-2.5 (1.3)
Southeast Whites	60.8 (0.7)	59.2 (1.1)	-1.6 (1.3)	60.8 (0.8)	59.6 (0.9)	-1.2 (1.2)	45.1 (0.7)	43.9 (0.6)	-1.2 (0.9)
NCW Whites	64.8 (0.4)	63.5 (0.4)	-1.3 (0.6)	64.2 (0.4)	62.4 (0.4)	-1.8 (0.6)	47.6 (0.3)	44.6 (0.4)	-3.0 (0.5)

**Composed of blacks and whites only; other races omitted.*
†Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.
***Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.*

TABLE A3. Mean Achievement of Black Students on Science Questions, by Racial Composition of School and by Region, 1969–73, Ages 9, 13 and 17 (Standard errors in parentheses)

	Southeast*			NCW†		
Percent White Age 9 (92 questions)	Mean Percent Correct 1970	Mean Percent Correct 1973	Mean Change	Mean Percent Correct 1970	Mean Percent Correct 1973	Mean Change
0–9%	40.0 (0.7)	43.6 (1.0)	+3.6 (1.2)	44.0 (2.1)	46.5 (1.1)	+2.5 (2.4)
10–39	43.4 (3.9)	44.2 (1.9)	+0.8 (4.3)	48.7 (1.9)	46.7 (2.1)	-2.0 (2.8)
40–59	44.3 (4.5)	44.2 (0.9)	-0.1 (4.6)	51.4 (2.2)	45.2 (1.6)	-6.2 (2.7)
60–79	50.1 (4.0)	47.7 (1.2)	-2.4 (4.2)	56.3 (2.2)	49.4 (1.5)	-6.9 (2.7)
80–100	46.6 (1.9)	42.5 (1.2)	-4.1 (2.2)	60.9 (1.5)	53.7 (1.8)	-7.2 (2.3)
Age 13 (67 questions)	**1969**	**1972**	**Change**	**1969**	**1972**	**Change**
0–9%	40.5 (1.1)	40.1 (0.8)	-0.4 (1.4)	42.8 (1.4)	39.9 (0.9)	-2.9 (1.7)
10–39	49.1 (6.5)	40.7 (2.7)	-8.4 (7.0)	48.1 (2.3)	40.7 (1.9)	-7.4 (3.0)
40–59	50.6 (0.6)	41.9 (2.1)	-8.7 (2.2)	49.0 (3.3)	45.2 (3.0)	-3.8 (4.5)
60–79	48.3 (5.9)	40.6 (2.1)	-7.7 (6.3)	47.6 (3.7)	43.1 (1.7)	-4.5 (4.1)
80–100	49.4 (2.5)	45.3 (3.0)	-4.1 (3.9)	54.5 (1.8)	46.9 (1.5)	-7.6 (2.3)
Age 17 (64 questions)	**1969**	**1973**	**Change**	**1969**	**1973**	**Change**
0–9%	31.4 (1.7)	29.4 (1.8)	-2.0 (2.5)	31.9 (1.5)	29.8 (2.4)	-2.1 (2.8)
10–39	26.2 (2.2)	32.1 (1.7)	+5.9 (2.8)	32.1 (14.2)	29.5 (1.8)	-2.6 (14.3)
40–59	32.7 (9.0)	31.4 (1.4)	-1.3 (9.1)	39.7 (4.5)	34.9 (2.5)	-4.8 (5.1)
60–79	38.2 (6.8)	31.2 (1.0)	-7.0 (6.9)	36.9 (3.5)	32.5 (1.2)	-4.4 (3.7)
80–100	35.2 (2.2)	33.2 (1.9)	-2.0 (2.9)	35.9 (1.4)	37.4 (1.2)	+1.5 (1.8)

**Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.*
†Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.

TABLE A4. Mean Achievement of White Students on Science Questions, by Racial Composition of School and by Region, 1969–73, Ages 9, 13 and 17 (Standard errors in parentheses)

	Southeast*			NCW†		
Percent White Age 9 (92 questions)	**Mean Percent Correct 1970**	**Mean Percent Correct 1973**	**Mean Change**	**Mean Percent Correct 1970**	**Mean Percent Correct 1973**	**Mean Change**
0–9%	53.2 (5.1)	43.0 (8.5)	-10.2 (9.9)	51.8 (2.0)	59.3 (5.5)	+7.5 (5.9)
10–39	55.3 (6.7)	55.7 (1.0)	+0.4 (6.8)	57.1 (3.1)	57.3 (1.8)	+0.2 (3.6)
40–59	57.0 (9.0)	58.3 (0.7)	+1.3 (9.0)	58.4 (2.7)	56.4 (2.6)	-2.0 (3.7)
60–79	59.2 (2.5)	60.0 (1.7)	+0.8 (3.0)	60.8 (1.8)	62.2 (1.2)	+1.4 (2.2)
80–100	61.1 (0.7)	59.3 (1.7)	-1.8 (1.8)	65.3 (0.4)	63.9 (0.4)	-1.4 (0.6)
Age 13 (67 questions)	**1969**	**1972**	**Change**	**1969**	**1972**	**Change**
0–9%	57.9 (4.5)	51.5 (2.3)	-6.4 (5.1)	64.9 (5.8)	59.0 (7.3)	-5.9 (9.3)
10–39	55.9 (7.8)	58.2 (1.6)	+2.3 (8.0)	58.3 (2.5)	53.7 (3.5)	-4.6 (4.3)
40–59	56.4 (7.2)	57.9 (1.8)	+1.5 (7.4)	59.0 (1.7)	59.8 (3.7)	+0.8 (4.1)
60–79	64.3 (4.2)	57.8 (1.6)	-6.5 (4.5)	62.4 (1.9)	61.2 (0.9)	-1.2 (2.1)
80–100	60.9 (1.0)	60.6 (1.0)	-0.3 (1.4)	64.4 (0.4)	62.7 (0.5)	-1.7 (0.6)
Age 17 (64 questions)	**1969**	**1973**	**Change**	**1969**	**1973**	**Change**
0–9%	52.7 – **	37.2 (4.1)	-15.5 – **	29.9 (0.4)	36.1 (4.5)	+6.2 (4.5)
10–39	45.5 – **	43.1 (2.2)	-2.4 – **	48.0 (3.7)	40.1 (2.5)	-7.9 (4.5)
40–59	42.5 (3.9)	41.7 (1.4)	-0.8 (4.1)	45.8 (2.7)	38.3 (2.5)	-7.5 (3.7)
60–79	50.5 (3.0)	43.0 (1.3)	-7.5 (3.3)	45.7 (0.9)	40.6 (1.5)	-5.1 (1.7)
80–100	44.9 (0.7)	45.0 (0.6)	+0.1 (0.9)	47.8 (0.4)	44.8 (0.4)	-3.0 (0.6)

**Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.*

†Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.

***Standard error greater than 50.0, due to extremely small sample size.*

TABLE A5. Mean Achievement of Black Students on Science Questions in Greater or Less Than 50% White Schools, by Region, 1969–73, Ages 9, 13 and 17 (Standard errors in parentheses)

	Southeast*			NCW†		
Percent White Age 9 (92 questions)	**Mean Percent Correct 1970**	**Mean Percent Correct 1973**	**Mean Change**	**Mean Percent Correct 1970**	**Mean Percent Correct 1973**	**Mean Change**
0–49%	40.2 (0.7)	43.4 (0.6)	+3.2 (0.9)	46.4 (1.4)	46.0 (0.9)	-0.4 (1.7)
50–100	47.2 (1.6)	45.7 (1.0)	-1.5 (1.9)	58.9 (1.5)	50.6 (0.9)	-8.3 (1.7)
Age 13 (67 questions)	**1969**	**1972**	**Change**	**1969**	**1972**	**Change**
0–49%	40.7 (1.0)	41.6 (1.1)	+0.9 (1.5)	44.7 (1.0)	40.3 (1.1)	-4.4 (1.5)
50–100	49.1 (1.7)	40.9 (0.5)	-8.2 (1.8)	52.2 (1.7)	45.2 (1.1)	-7.0 (2.0)
Age 17 (64 questions)	**1969**	**1973**	**Change**	**1969**	**1973**	**Change**
0–49%	31.3 (1.7)	30.6 (1.2)	-0.7 (2.1)	33.2 (1.2)	30.1 (1.4)	-3.1 (1.8)
50–100	35.3 (2.1)	31.7 (0.8)	-3.6 (2.2)	35.2 (1.3)	35.4 (0.8)	+0.2 (1.5)

**Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.*
†Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.

TABLE A6. Mean Achievement of White Students on Science Questions in Greater or Less Than 50% White Schools, by Region, 1969–73, Ages 9, 13 and 17 (Standard errors in parentheses)

	Southeast*			NCW†		
Percent White Age 9 (92 questions)	**Mean Percent Correct 1970**	**Mean Percent Correct 1973**	**Mean Change**	**Mean Percent Correct 1970**	**Mean Percent Correct 1973**	**Mean Change**
0–49%	54.3 (3.4)	58.6 (1.2)	+4.3 (3.6)	58.5 (1.7)	59.0 (2.4)	+0.5 (2.9)
50–100	61.0 (0.7)	59.3 (1.2)	-1.7 (1.4)	65.0 (0.4)	63.6 (0.4)	-1.4 (0.6)
Age 13 (67 questions)	**1969**	**1972**	**Change**	**1969**	**1972**	**Change**
0–49%	59.3 (2.8)	57.9 (1.3)	-1.4 (3.1)	59.0 (1.7)	56.2 (2.5)	-2.8 (3.0)
50–100	60.9 (0.9)	59.8 (0.9)	-1.1 (1.3)	64.3 (0.4)	62.5 (0.4)	-1.8 (0.6)
Age 17 (64 questions)	**1969**	**1973**	**Change**	**1969**	**1973**	**Change**
0–49%	49.1 (0.7)	43.0 (2.0)	-6.1 (2.1)	46.0 (2.5)	38.7 (2.4)	-7.3 (3.5)
50–100	45.0 (0.7)	44.0 (0.6)	-1.0 (0.9)	47.6 (0.4)	44.6 (0.4)	-3.0 (0.6)

**Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.*
†Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.

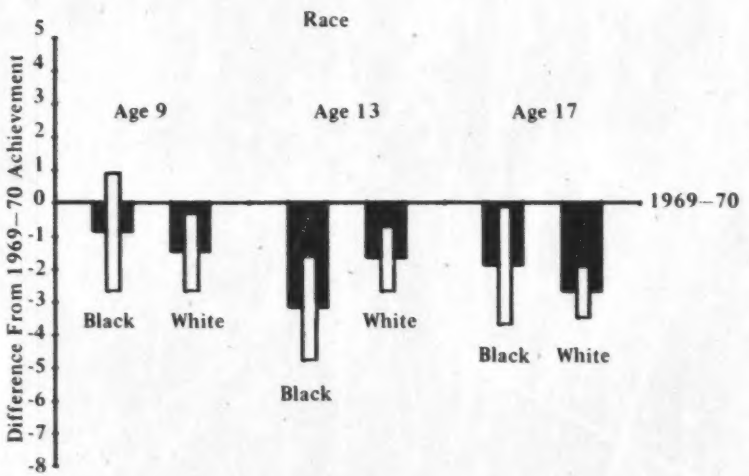
APPENDIX B

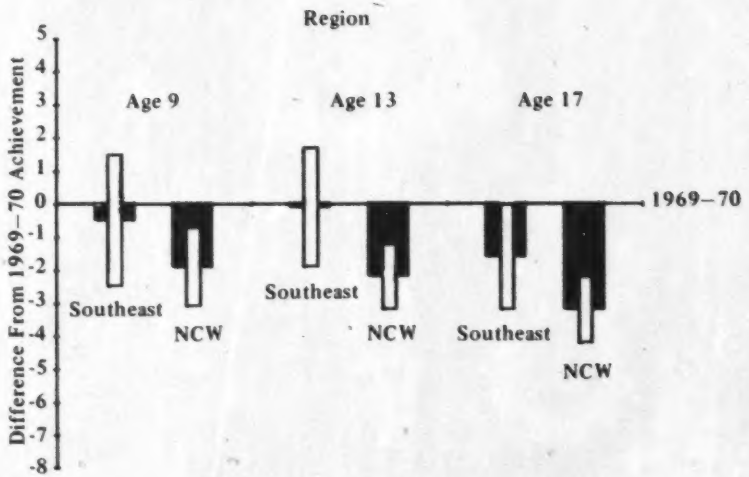
CONFIDENCE INTERVAL ESTIMATES

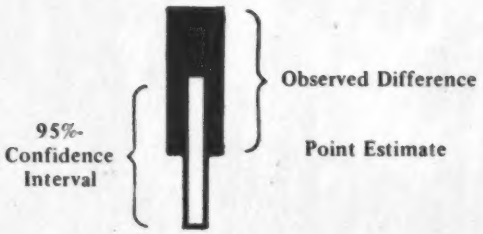
Exhibits B1 and B2 present confidence-interval limits for the mean difference in achievement in science between 1969—70 and 1972—73. For each group and at each age the white bar covers a range that we are 95% confident includes the average over all possible repetitions of the sample. For example, in Exhibit B1 it can be stated with 95% confidence that the average change in science achievement for 9-year-olds in the NCW region declined between 0.7 and 3.1 percentage points. On the other hand, we cannot speak with confidence about the observed change for 9-year-olds in the Southeast, since it is almost as likely that performance improved as it is that performance declined.

The data in Exhibits B1 and B2 show that only 9-year-old blacks in the Southeast improved significantly at the 5% level. Except for Southeastern 17-year-olds, who declined significantly at the 5% level, all other Southeastern groups showed no significant change at the 5% level. All NCW groups except 17-year-old blacks showed significant declines in achievement at the 5% level.

EXHIBIT B1. 95%-Confidence Limits Around the Difference in Means in Science Achievement by Region and Race, 1969–70 and 1972–73



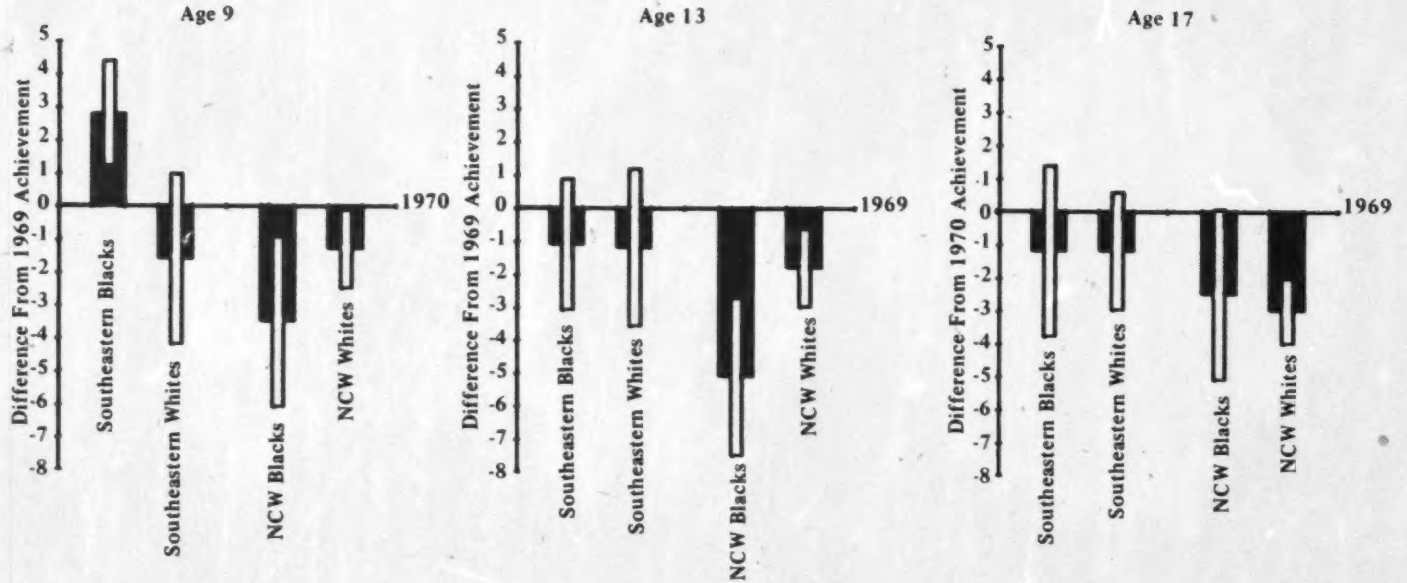


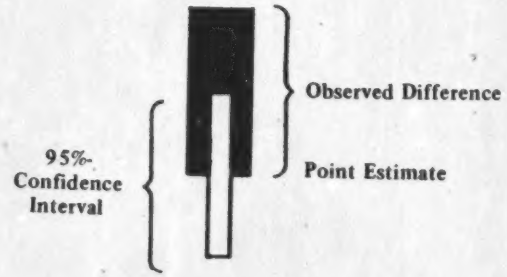


Changes in Mean Achievement Levels:
95%-Confidence Intervals

Southeast	**Blacks**
Age 9: -2.5% to +1.5%	Age 9: -2.7% to +0.9%
Age 13: -1.9% to +1.7%	Age 13: -1.6% to -4.8%
Age 17: -3.2% to 0.0%	Age 17: -0.1% to -3.7%
NCW	**Whites**
Age 9: -0.7% to -3.1%	Age 9: -0.3% to -2.7%
Age 13: -1.2% to -3.2%	Age 13: -0.7% to -2.7%
Age 17: -2.2% to -4.2%	Age 17: -0.9% to -3.7%

EXHIBIT B2. 95%-Confidence Limits Around the Difference in Means in Science Achievement for Southeastern Blacks and Whites and NCW Blacks and Whites, 1969–70 and 1972–73





Changes in Mean Achievement Levels:
95%-Confidence Intervals

Southeastern Blacks	NCW Blacks
Age 9: +1.2% to +4.4%	Age 9: -0.9% to -6.1%
Age 13: -3.1% to +0.9%	Age 13: -2.7% to -7.5%
Age 17: -3.8% to +1.4%	Age 17: -5.1% to +0.1%
Southeastern Whites	NCW Whites
Age 9: -4.2% to +1.0%	Age 9: -0.1% to -2.5%
Age 13: -3.6% to +1.2%	Age 13: -0.6% to -3.0%
Age 17: -3.0% to +0.6%	Age 17: -2.0% to -4.0%

APPENDIX C

DISTRIBUTIONS OF BLACK AND WHITE STUDENTS ATTENDING SCHOOLS OF DIFFERENT RACIAL COMPOSITIONS

TABLE C1. Distribution of Black Students Attending Schools of Different Racial Composition, By Region, 1969–73, Ages 9, 13 and 17

	Southeast*			NCW†		
Percent White Age 9	Percent of Students 1970	Percent of Students 1973	Percentage Points Difference	Percent of Students 1970	Percent of Students 1973	Percentage Points Difference
0–9%	71.7%	24.7%	-47.0	36.2%	61.1%	+24.9
10–39	3.3	10.6	+ 7.3	13.8	10.8	- 3.0
40–59	1.6	37.5	+35.9	14.9	6.0	- 8.9
60–79	7.8	21.0	+13.2	8.7	12.1	+ 3.4
80–100	11.4	6.0	- 5.4	20.9	9.9	-11.0
0–49	75.5	48.6	-26.9	59.2	72.8	+13.6
50–100	20.2	51.1	+30.9	35.3	27.2	- 8.1
Unknown	4.3	0.3	- 4.0	5.5	0.0	- 5.5
Age 13	**1969**	**1972**	**Difference**	**1969**	**1972**	**Difference**
0–9%	71.6%	17.1%	-54.5	38.3%	42.6%	+ 4.3
10–39	4.2	13.6	+ 9.4	20.1	19.1	- 1.0
40–59	3.0	32.4	+29.4	10.2	7.7	- 2.5
60–79	7.8	24.2	+16.4	4.5	13.6	+ 9.1
80–100	10.1	12.6	+ 2.5	18.5	17.0	- 1.5
0–49	75.7	50.7	-25.0	64.2	62.9	- 1.3
50–100	20.9	49.1	+28.2	27.2	37.1	+ 9.8
Unknown	3.4	0.2	- 3.2	8.6	0.0	- 8.6
Age 17	**1969**	**1973**	**Difference**	**1969**	**1973**	**Difference**
0–9%	66.5%	21.2%	-45.3	29.7%	30.4%	+ 0.7
10–39	2.5	14.2	+11.7	19.8	25.3	+ 5.5
40–59	3.8	26.0	+22.2	15.7	10.9	- 4.8
60–79	4.3	28.7	+24.4	14.1	15.2	+ 1.1
80–100	22.9	9.8	-13.1	20.6	18.1	- 2.5
0–49	70.7	40.2	-30.5	56.0	58.4	+ 2.4
50–100	29.4	59.8	+30.4	43.8	41.5	- 2.3
Unknown	0.0	0.0	0.0	0.2	0.1	- 0.1

**Composed of Southeastern blacks and whites only, omitting other races from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.*

†Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.

TABLE C2. Distribution of White Students Attending Schools of Different Racial Composition, By Region, 1969–73, Ages 9, 13 and 17

	Southeast*			NCW†		
Percent White Age 9	Percent of Students 1970	Percent of Students 1973	Percentage Points Difference	Percent of Students 1970	Percent of Students 1973	Percentage Points Difference
0–9%	2.0%	0.1%	- 1.9	0.8%	1.2%	+0.4
10–39	2.1	1.1	- 1.0	1.4	0.8	-0.6
40–59	0.7	16.5	+15.8	2.1	1.4	-0.7
60–79	9.5	21.5	+12.0	4.6	6.5	+1.9
80–100	84.1	60.0	-24.1	87.1	90.0	+2.9
0–49	4.2	5.6	+ 1.4	2.8	2.6	-0.2
50–100	94.1	93.6	- 0.5	93.2	97.4	+4.2
Unknown	1.7	0.8	- 0.9	4.0	0.1	-3.9
Age 13	**1969**	**1972**	**Difference**	**1969**	**1972**	**Difference**
0–9%	4.7%	0.6%	- 4.1	0.3%	0.2%	-0.1
10–39	3.5	3.0	- 0.5	0.9	0.9	0.0
40–59	1.3	11.4	+10.1	2.6	1.9	-0.7
60–79	7.9	19.1	+11.2	2.4	7.6	+5.2
80–100	75.4	65.6	- 9.8	88.4	89.2	+0.8
0–49	8.2	9.5	+ 1.3	2.4	1.3	-1.1
50–100	84.6	90.2	+ 5.6	92.1	98.5	+6.4
Unknown	7.2	0.3	- 6.9	5.5	0.2	-5.3
Age 17	**1969**	**1973**	**Difference**	**1969**	**1973**	**Difference**
0–9%	1.5%	1.7%	+ 0.2	0.1%	0.2%	+0.1
10–39	0.5	2.2	+ 1.7	1.2	1.1	-0.1
40–59	1.5	9.6	+ 8.1	1.8	1.7	-0.1
60–79	2.1	34.8	+32.7	5.4	5.4	-0.1
80–100	94.4	51.7	-42.7	89.9	90.7	+0.3
0–49	2.8	5.4	+ 2.6	2.1	1.7	-0.4
50–100	97.2	94.6	- 2.6	96.4	97.4	+0.4
Unknown	0.0	0.0	0.0	1.5	0.9	-0.1

**Composed of Southeastern blacks and whites only, omitting other races, from Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia.-*
†Composed of North, Central and West blacks and whites only, omitting other races, from the District of Columbia and the 38 states not listed as Southeast.

APPENDIX D

NUMBERS OF STUDENTS PARTICIPATING IN SCIENCE ASSESSMENTS

TABLE D1. Number of 9-Year-Olds Participating in Each Assessment

	1970			1973		
	National*	Southeast†	NCW**	National*	Southeast†	NCW**
Nation	19,468	4,501	14,967	18,638	4,686	13,952
Blacks	3,119	1,472	1,647	3,265	1,523	1,742
Whites	14,598	2,951	11,647	13,982	3,129	10,853
Blacks in 0–9% white schools	1,773	1,147	626	1,470	446	1,024
Blacks in 10–39% white schools	315	46	269	380	206	174
Blacks in 40–59% white schools	225	17	208	682	527	155
Blacks in 60–79% white schools	211	93	118	505	268	237
Blacks in 80–100% white schools	397	121	276	225	73	152
Whites in 80–100% white schools	12,387	2,462	9,925	11,188	1,666	9,522
Whites in 60–79% white schools	859	275	584	1,575	743	832
Whites in 40–59% white schools	329	19	310	864	631	233
Whites in 10–39% white schools	273	60	213	166	63	103
Whites in 0–9% white schools	202	63	139	161	5	156
Blacks in 0–49% white schools	2,228	1,201	1,027	2,085	865	1,220
Blacks in 50–100% white schools	693	223	470	177	655	522
Whites in 50–100% white schools	13,468	2,752	10,716	13,355	2,841	10,514
Whites in 0–49% white schools	582	127	455	599	267	332

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TABLE D2. Number of 13-Year-Olds Participating in Each Assessment

	1969			1972		
	National*	Southeast†	NCW**	National*	Southeast†	NCW**
Nation	21,708	5,070	16,638	23,507	6,006	17,501
Blacks	3,753	1,751	2,002	3,922	1,908	2,014
Whites	16,191	3,213	12,978	17,796	4,017	13,779
Blacks in 0–9% white schools	2,214	1,339	875	1,434	481	953
Blacks in 10–39% white schools	398	57	341	695	326	369
Blacks in 40–59% white schools	198	36	162	733	597	136
Blacks in 60–79% white schools	231	116	115	664	371	293
Blacks in 80–100% white schools	424	131	293	394	131	263
Whites in 80–100% white schools	13,592	2,383	11,209	14,226	2,209	12,017
Whites in 60–79% white schools	754	254	500	2,131	906	1,225
Whites in 40–59% white schools	435	36	399	970	671	299
Whites in 10–39% white schools	258	92	166	344	192	152
Whites in 0–9% white schools	268	200	68	81	29	52
Blacks in 0–49% white schools	2,704	1,396	1,308	2,588	1,226	1,362
Blacks in 50–100% white schools	761	283	478	1,332	680	652
Whites in 50–100% white schools	14,586	2,673	11,913	16,862	3,391	13,471
Whites in 0–49% white schools	721	292	429	890	616	274

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TABLE D3. Number of 17-Year-Olds Participating in Each Assessment

	1969			1973		
	National*	Southeast†	NCW**	National*	Southeast†	NCW**
Nation	22,926	4,652	18,274	25,865	6,560	19,305
Blacks	2,610	1,113	1,497	3,936	1,971	1,965
Whites	18,952	3,505	15,447	20,370	4,494	15,876
Blacks in 0–9% white schools	1,230	774	456	1,159	541	618
Blacks in 10–39% white schools	309	19	290	838	373	465
Blacks in 40–59% white schools	286	40	246	678	473	205
Blacks in 60–79% white schools	235	28	207	824	452	372
Blacks in 80–100% white schools	548	252	296	435	132	303
Whites in 80–100% white schools	17,064	3,337	13,727	16,133	2,109	14,024
Whites in 60–79% white schools	1,006	37	969	2,763	1,571	1,192
Whites in 40–59% white schools	354	52	302	831	525	306
Whites in 10–39% white schools	297	13	284	408	202	206
Whites in 0–9% white schools	79	66	13	148	87	61
Blacks in 0–49% white schools	1,684	810	874	2,187	1,056	1,131
Blacks in 50–100% white schools	924	303	621	1,747	915	832
Whites in 50–100% white schools	18,247	3,395	14,852	19,499	4,054	15,445
Whites in 0–49% white schools	553	110	443	784	440	344

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